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THE
ART OF TANNING
AND
CURRYING LEATHER:

With an Account of all the
DIFFERENT PROCESSES
Made Use of in
EUROPE AND ASIA
FOR

Dying Leather Red and Yellow.

Collected and Published at the EXPENCE of the
DUBLIN SOCIETY.

To which are added,

Mr. PHILIPPO's Method of Dying the Turkey
Leather, as approved of by the Society for the
Encouragement of Arts, &c. and for which he had
a Reward of One Hundred Pounds, and their Gold
Medal, for the Secret.

L O N D O N,

Re-printed for J. N O U R S E, in the STRAND,
Bookseller to His MAJESTY.

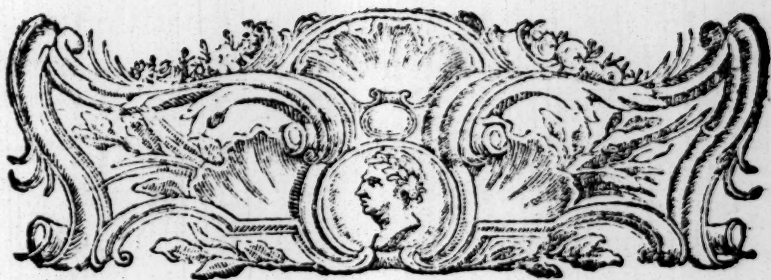
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P R E F A C E

THE ART OF CURRYING
was for many years confined to the
British Isles, their well prepared products
the best in the known world, and the
extraordinary good quality of their wares
gave the palm of commerce to this
article to Great Britain and Ireland, and
was sold or bartered for other commodities
to Spain, Portugal, France, and Italy. The
potencies of this article and their wares
were long viewed as profitable and extra-
five trade with a nation, and as a result
is the market of the world, and as a result
led to the great success of the British
nation.



P R E F A C E.

THE ART OF TANNING, and of CURRYING STRONG LEATHER, was for many centuries confined to the *British* isles: their rich pasturage produced the best hides in the known world, and the extraordinary good quality of their native oak, gave the palm of commerce in this article to *Great Britain* and *Ireland*, which was sold or bartered for other commodities to *Spain*, *Portugal*, *France*, and *Italy*. The potentates of these parched and sterile countries, long viewed this profitable and extensive trade with a jealous eye, and as necessity is the mother of invention, all arts were used to bring their meagre hides to perfection.

In the last century, the great lights of philosophy, illumined the dark paths of the mechanic arts. *France* held out her royal bounty, to induce the learned of her country to investigate the processes of her manufactures, and to remove those obstacles and absurdities, to which all manufacturers seem obstinately chained and fettered. National edicts succeeded these discoveries, and the ignorant operator was punished with confiscation of his goods, if he did not comply with the methods laid down by these learned men, when approved of by the ACADEMY OF SCIENCES, and the INTENDANT OF COMMERCE.

Whilst our rival in trade was making such strides towards the perfection of her manufactures, and was daily seducing our artists under her protection, *Great-Britain* and *Ireland* were sunk in a lethargy, from which they are now, too late, recovering.

In the ART OF TANNING, great improvements have been made in every state of *Europe*, whilst we still pursue the method practised by our fore-fathers a thousand years ago. The high value of our lands, and the cutting down of our woods, have
raised

raised the prices of raw hides and of bark so much, that of late years the tannery of *Ireland* has been a losing trade ; which, added to the progress made in this manufacture by foreigners, who now chiefly supply their own markets, has caused the export of tanned leather to decline, and that of raw hides to increase to the loss of 500,000*l.* *per annum* to this impoverished country.

The DUBLIN SOCIETY foreseeing this calamity for a series of years, offered considerable premiums for the discovery of a substitute for oak-bark : heath, briars, tormentil, oak saw-dust, and many other vegetables were recommended ; but, after repeated experiments, they were found not to have sufficient strength for thick leather, or were not to be had in quantity to answer the national demand.

In the year 1746, a cow skin and a calf skin were laid before the SOCIETY by *Henry Bond*, Esq. of the county of *Armagh*, which he declared he had tanned with the bark of the common *Scotch Fir* only, without any other bark. They were examined by several persons well skilled in leather, and were judged by them to be very well tanned.

These skins remained in his bark-vat but three months and a half; he put twenty pounds weight of dried bark, free of the outside husky excrescence, in his vat; but for foal-leather, a greater quantity of bark, and a much longer time for lying in the vat, is necessary.

The SOCIETY strongly recommended this experiment, and requested such as had this species of wood growing on their estates, to cut down the trees in the month of *May*, *June*, or *July* next ensuing; but no one had the spirit to pursue Mr. *Bond*'s discovery.

In the year 1768, Dr. *Mac Bride*, a gentleman of extensive chemical knowledge, discovered a method of shortening the tanning, and of improving the quality of the leather.

This discovery took its rise from a series of experiments, which were originally instituted and carried on with a view of improving certain branches of medical knowledge, and thus, like most other discoveries, sprung from a source whence it could least of all have been expected.

The

The Doctor having communicated the importance of his discovery to the SOCIETY, at his request, they engaged Mr. *Laban*, a skilful tanner, to make a trial of this new method, and the SOCIETY paid the expence of fitting up an old tan yard for this purpose, which was estimated at fifty pounds. A committee of the SOCIETY frequently visited the process; and, in *September*, 1768, they made the following report, *viz.*

That eighty dozen of calve skins had been made and sold, which were not longer in finishing than three months, and would have been done in a much shorter time, had the alterations in the tan-yard been completed. That, in the Doctor's new method, the bark which has been exhausted in the common way, is made use of with greater advantage, and produces a great saving in bark.

That from a variety of experiments made by Mr. *Laban* it appeared, that two months is the space of time required by the new method of tanning calve skins in large quantities, although it is practicable to tan small quantities completely within the space of ten days.

That this method is so extremely simple and easy, that it may be introduced immediately into the common tan-yards, as it requires no other alteration than that the tan-vats be defended against rain. That the expence of the new-discovered materials and of the utensils for preparing them is so trifling, that they cannot amount to more than five shillings *per cent.* on the value of the goods tanned.

The COMMITTEE OF COMMERCE having taken this branch of trade into their consideration, spent several weeks of the last winter, with indefatigable attention in their enquiries.

In the course of this examination, they called on Mr. *Laban* (who had then retired from the business) for further information of the importance of this discovery ; and he laid before the Committee the following comparative view of the expence of Dr. *Mac Bride's* method, and of the common method still practised, by which the profits appear to be in favour of the former more than twenty *per cent.*

First,

First Cost and Expences of 100 hides
Tanned into Uppers, by the Old
Method.

	l.	s.	d.
100 hides, at 1l. 5s. <i>per</i> hide	125	0	0
Interest, at 6 <i>per cent.</i> for 18 months, the usual time re- quired to tan these hides	11	5	0
100 barrels of bark, at 6l. 10s. <i>per</i> ton — — —	48	15	0
Journeymens wages for 18 months on 100 hides —	7	16	0

N. B. One man will work 500
hides in one year, liming,
masterings, &c. at 1s. *per*
hide — — —

5	0	0
<hr/>		
197	16	0
<hr/>		

x P R E F A C E.

First Cost and Expences of 100 hides
Tanned into Uppers, by Dr. MAC
BRIDE's Method.

	l.	s.	d.
100 hides, at 1l. 5s. <i>per</i> hide	125	0	0
Interest, at 6 <i>per cent.</i> for 12 months at most — —	7	10	0
80 barrels of bark, at 6l. 10s. <i>per</i> ton — — —	39	0	0
Journeymens wages — —	5	4	0
Liming, &c. — —	5	0	0
	181	14	0
In favour of the new method	16	2	0
	197	16	0

First Cost and Expences of 100 hides
Tanned into Soal Leather, by the
Old Method.

	l.	s.	d.
100 hides, at 1l. 5s. <i>per</i> hide	125	0	0
Interest, as before — —	11	5	0
Bark, as before — —	48	15	0
Wages, ditto — —	7	16	0
To raising the hides, at 2s. <i>per</i> hide — — —	10	0	0
	202	16	0
	First		

P R E F A C E. xi

First Cost and Expences of Tanning 100 Hides into Soal Leather, by Dr. MAC BRIDE's Method.

	l.	s.	d.
100 hides, as before — —	125	0	0
80 barrels of bark, ditto —	39	0	0
Interest for 9 months, at 6 <i>per</i> <i>cent.</i> — — —	5	12	6
Journeymens wages for nine months on 100 hides —	3	18	0
To raising, &c. at 6d. <i>per</i> hide	2	10	0
	<hr/>		
	176	0	6
In favour of the new method	26	15	6
	<hr/>		
	202	16	0
	<hr/>		

Which saving of 26l. 15s. 6d. added to 16l. 2s. makes 42l. 17s. 6d. saving on 400l. 12s. And a further profit is said to arise to this new method, by encreasing the weight and solidity of the leather about eight pounds in seventy.

It appears that the Doctor's discovery consists partly in rendering the hides more susceptible of the impression of the ooze,
and

and partly in making the ooze more penetrating; but as he has hitherto thought proper to communicate his secret only to one company, who carry on the business at *Belfast*, the publick are hitherto deprived of the benefit which might arise from it.

A letter was produced to the COMMITTEE OF COMMERCE, from Mr. *Mac Tier*, who manages the affairs of this company, in which he declares, that the time sufficient for tanning butts or uppers thoroughly, by the Doctor's method, is from six to nine months, according to their weight, and that the very heaviest *soal* leather does not require more than ten months.

More than three hundred hides have been brought from this tannery, and sold in *Dublin*, and several have been exported to *Spain*: no complaints have hitherto been made of the quality of this leather, and probably another season will confirm this discovery to be of great importance to the trade of *Ireland*.

The tanners of *London* have of late applied boiling water, or boiling *spent ooze*, on the tan cakes, now generally thrown away or sold to the poor for fuel: by
this

this application of hot water, a stronger ooze is obtained, than was at first produced from the new bark, not can all its strength be extracted by the first boiling: it is used in the common manner when cold. This must be a very great saving of bark, and seems well worth the attention of the *Irish* tanners, who buy their bark at so dear a rate; particularly if they follow the method of *scouring* with bark liquor, as recommended in the following treatise.

It is certain that no ligneous substance will produce all its astringent salts, without hot water, and as a proof that they are not all extracted from the bark in the common method, we need only refer to the hot-beds made with the old tan cakes usually purchased by the gardeners.

And there cannot be a doubt, but that coppice-oak-wood, or branches, cut and ground as bark, will be found by the application of hot water, to render in proportion to their specific gravity, a stronger ooze than the bark itself, though more slow in parting with its salts.

The SOCIETY have been pleased to charge me with the publication of this treatise.

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treatise. I have accepted the laborious task with pleasure, being persuaded my time cannot be employed in a more national object. I flatter myself the generosity of that patriotic society in printing and dispersing this work, at their expence to the tanners of *Ireland*, will be amply rewarded by the encrease of the exports of tanned leather, the natural commodity of this country, to its utmost bounds.

The *French* manufacturers abound with technical terms; where those of the *Irish* tanners corresponded, I have made use of them, and where deficient, I have endeavoured to explain the process by the most familiar expressions, so as to render it intelligible to those, for whose use it was intended.

C. V. A Member of the Society.

Dublin, Oct. 1,

1773.

PREMIUMS

PREMIUMS for importing Bark, and exporting Leathern Goods.

A premium of ten shillings per ton will be given to the person or persons who shall import into this kingdom good and merchantable oak-bark fit for tanning, from the east and northern countries, *Spain, Holland, or America*, between the 1st day of *November, 1773*, and the 1st day of *November, 1774*, provided that the said premiums shall not exceed the sum of 300*l.* and if it should, then the said sum of 300*l.* to be divided proportionably to the importers, according to the quantity of such bark by each of them respectively imported.

To be adjudged the 10th of *November, 1774.*

A premium of 10*l.* per cent. on the exportation of all kinds of leathern goods, that shall be well and merchantably wrought up and exported between the 1st of *November, 1773*, and the 1st day of *November, 1774*, provided the amount of the said premiums adjudged to the claimants, shall not exceed 200*l.* and if
it

it should, then the sum of 200l. to be divided proportionably to the claimants, according to the value of leathern goods of all kinds, by each of them respectively exported, and the said leathern goods for exportation, shall be subject to the inspection of a person to be employed by the Society.

To be adjudged the 10th. of *November*, 1774.

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THE ART OF TANNING.

Of Hides and their Qualities.

THE *Irish* Hides are naturally thick, and fill better than those of *France*, owing to the excellent pasturage of *Ireland*; the market for these is at *Namur*. Hides with black hair are not esteemed; this is one of the many ridiculous notions which prevail amongst Artists, which a physical knowledge only can remove, and hitherto this has not gained sufficient ground to expel these vulgar ideas.

The Hides of Bulls are less solid, make a thinner Leather than others, but yet strong in proportion; for the same reason that animals grow fatter by being deprived of their genital parts, their Hides must grow thicker, more full of juice, and of a more flexible texture. Therefore the Leather of Bulls should only be worked up into inside soles and women's shoes.

I observe that in *England* as well as in *France*, Cow Hides are esteemed stronger and better than Oxen; but Bulls Hides still have their value. For this reason, the Tanners pretend that they buy

none but Cow Hides, and the Butchers will tell you they kill none but Oxen, because the flesh is most valued for the Table, so that it is become a proverb in *France*, to say with the Tanners, *all Oxen are Cows*, and with the Butchers, *all Cows are Oxen*.

Of Green Hides.

It is usual in *France* to weigh the Hides green, and to mark the weight by certain cuts or nicks in the tail.

Hides are counted small, and of less value in proportion, when they weigh 60 pounds or under; when they exceed 60 pounds, they are bought as large Hides; the highest is 35 livres the hundred weight, that is 7 sols a pound, but this includes the horns, ears, part of the skull, dirt, water, and blood, collected in the slaughter-house.

To indemnify the Merchants for this waste, an abatement is made from 2 livres 10 sols, to 5 livres in every ten. So that a green Hide in the hair as taken from the carcase, is reduced by this allowance 5, 6, or 7 sols. The price varies often; in 1745, when there was a murrain among the horned cattle, and also a war, the value was encreased one half.

Custom has prevailed time immemorial, to weigh and sell the Hides in the Hair, with horns, ears, lips, &c. and in that state some will weigh 100 pounds; but the loss in weight after being tanned and dried, is considerable, sometimes more than half the first weight.

The

The Butcher, to encrease his profit, often imposes on the Buyer by these means, 1st, by keeping his cattle in a stable with little or no litter, in order to increase the quantity of muck and dirt on the belly and tail: 2dly, by leaving a greater quantity of the skull and bones of the head: 3dly, by steeping the Hide in the water, blood, and dirt of the slaughter-house; but the Buyer must examine and guard against all these impositions.

Of Salted Hides.

Such Hides as the Butchers cannot immediately dispose of to the Tanners, must be salted, lest they putrify and corrupt; this is done with 3 pounds and a half, or 4 pounds of Salt (*de morue*) or Salt mixed with Alum, which is lightly scattered over the flesh side, observing to put a little more at the head, and along the back and edges, as being the most difficult parts to save.

In winter, it will require sometimes 8 or 10 pounds of Salt to a Hide, because they dry but slowly, and the danger of putrefaction at that season continues longer.

The Butchers of *Paris*, who usually deliver their Hides every 15 days or 3 weeks, and sometimes longer, must of necessity salt their Hides, and they allow the Tanner 5 pounds in every Hide to be deducted from the weight.

In 1673, an agreement was made between the Butchers and Farmers General of *France*, by which they were obliged to furnish the Butchers with Salt scraped up from the bottoms of the

4 THE ART OF TANNING.

vessels which had been employed on the *Newfoundland* Fisheries, and on taking the Cod out of the hold of the vessel, a great quantity of Salt falls off; it is thus collected for the use of salting Hides only (hence it is called Salt of Morue, or of Cod). This agreement was renewed in 1726, when it was stipulated that the Butchers should pay 16 livres 19 sols for a minot (or $\frac{1}{4}$ of a sextier) of this Salt, besides the expence of Officers, Measurers, Porters, &c.

Every Butcher must return the number of cattle he proposes to kill the month following, and the quantity of Salt he shall have occasion for, computing 4 pounds of Salt for every hide.

The *Hungarian* Leather Tanners also are supplied with this Salt, on condition that they mix in every minot (or $\frac{1}{4}$ of a sextier) 8 pounds of pounded Alum at their own cost, and also ashes to prevent their making use of this Salt in their kitchens, or for domestic use.

So that Tanners Salt stands them in 25 livres a minot, or 4 sols a pound, instead of 12 sols, the price of the common Salt. The mixture of Alum renders this Salt useless for any other purpose.

In the sea-ports they use the worst of Salts (called the *Sardina* Salt, another pickled fish) and the Butchers thus situated, would have a great advantage if the Farmers General had not an eye over them.

The Hides being salted, they are folded in two, lengthways, so that each extremity falls on its opposite; then they are folded again, beginning with

THE ART OF TANNING. 5

with the pattes, then the navel towards the back, then head to tail, and tail to head; this folding is finished by another which doubles the whole, and forms a square from one to two feet on each side.

The salted Hides are piled in threes and fours in a pile, and they are thus left that the Salt may penetrate for the space of three or four days.

When the Salt has had time to penetrate the texture of the Hides, they may be dried without danger of corrupting; for this purpose, they are extended on a perch, the flesh side outwards, observing to let more than half from the hind quarters hang down on one side, that the tender and thin parts may not dry quicker than the thickest.

It commonly requires 8 days in summer, and 15 in winter to dry a Hide. When dry, they lose about four-sevenths of the weight as delivered from the carcase; thus a Hide green of 70 pounds, contains 40 pounds of superfluous moisture, and will weigh but 30 when dried.

Of washing the Hides.

When the Hides are green, that is, when they are fresh, they are plunged into water, to cleanse them from the blood and filth of the slaughter-house; this is an occupation so necessary, that every Tannery should be fixed on the banks of a running stream, the water of which must not be so hard and astringent as well-water; if the stream be rapid, the Hides must be fastened to two posts fixed in the bed of the river.

Dried Hides are likewise plunged into water, but require a longer time to soften than green Hides.

They are taken out once each day, and laid on the beam, where they receive a scraping with a round knife; sometimes they are trod or trampled, to render them more supple and pliant, and to make them soak quicker; and in this manner they are treated daily, soaking and trampling them, until they be pliable and thoroughly soaked.

They are then plunged into water, until they appear ready to corrupt, for the more they are soaked, the better they will tann, and the better they will be in every respect.

Yet there is a proper time for keeping them in water; their tendency to corrupt may be known by their foetid smell, and this must be minutely attended to. It must also be considered, that some waters will cause them to corrupt sooner than others, such in particular, as those streams where Dyers wash their cloaths, if they be higher to the stream than the Tannery; fat gross Hides will require about six hours soaking; Cow Hides twenty-four, and Calve Skins forty-eight hours.

If the Hides are salted, they will require two, three, or four days, according as the weather is hot or cold; they are taken out every day for the space of two hours, that the water may penetrate better, and they are stirred about in the water to cleanse them from the filth and salt; the last time they are taken out, they are rinsed by force of hands to squeeze out the salt. Care should be taken

taken in rincing them, not to drive them to the bottom of the brook, where the stones, gravel, mud, &c. may hurt them.

If a Fulling-Mill be near the Tannery, it is of great advantage; for a Hide will be more supple, better rinced, sooner pliable, and fitter for the next operation in one hour, under the hammer of a Fulling-Mill, than a whole day by men's hands; but the scraping must not be omitted to render the hair and flesh more ready to depart from the Hide, and which comes off the easier, in proportion to the state of pliability it is brought to.

Before dried Hides are fleshed (flesh scraped off) they must be stamped with the feet, the head cut off from the mouth to the eyes, the ears cut off, the bones of the skull cut out, the flesh scraped, and all superfluous parts taken off. Green Hides require less scraping than dried Hides.

After scraping, they must again be rinced in running water, and then extended on a perch to drain for twenty-four hours; during which time, they must be turned twice, and twisted at the extremities, where the water naturally settles. This delay of twenty-four hours may be very well saved, by laying the Hide on the beam, and passing the round knife over it, then leaving it to dry twenty-four hours; yet there is some danger of leaving the Salt in them by this method.

Of Liming the Hides.

To prepare the Hides for the penetration of the Tan, the pores must be dilated, and the substance swelled; this is done by various methods; it is

our business to explain the whole; for on this first operation depends the success of the rest. A Hide cannot be well tanned if it be not well handled in the scowring and liming. And although we are now going to treat of the method of Liming, we must advertise the Reader, that this is the worst of all we are about to describe.

The most ancient method practised to prepare Hides for the Tan, consists in adding Lime to the Pits to scower and swell them. The Lime being an absorbent Earth, produces in water a saline alkaline caustick matter, which attacks, corrodes, and burns all Animal Substances thrown into it; for this reason, it is usual to let the Lime be thoroughly slacked in water, that the fire may be all cast out of it before the Hides are laid into the Pits.

One cubic foot (or a minot) of Lime costs at *Paris* 20 sols, and the muid, which contains 48 cubic feet, costs 50 livres. Each Hide requires about $\frac{1}{3}$ or $\frac{1}{4}$ of a cubic foot of Lime.

Where Lime only is used, there must be many Pits, into each of which the Hide must successively be passed, in the space of ten, twelve, or fifteen months. When the Hide is perfectly softened, it must be put into a dead pit, that is, into a pit which has spent all the fire of the Lime; it must be intirely covered by the water. In this pit it is left eight days, after which they must be taken out and piled up for eight days more.

After these eight days, they must be again put into the same pit as before, and so alternately eight days out and eight days in, for two months; this

this is the time a dead pit requires to take off the hair.

The different provinces of *France* follow different methods with their Lime Pits. In *Angoumois*, they use twelve pits; the two first *dead* pits, the four next *weak*, the six last *alive* or *quick*; each is composed of two barrels of Lime with one sack of Ashes.

In *Poitou* they use five pits; two dead ones, and three *alive*; each has from one to two barrels of Lime, with one sack of Ashes. In *Britanny* they have six pits, the first dead, the second *weak*, and the four last *alive*. Others have six pits, all *alive* or of *quick Lime*, which they encrease in strength by little and little, by a progressive addition of Lime and Ashes; and these Tanners never take the hair off, until they come out of the fourth or fifth pit, thinking that the hide swells or raises better in the hair, than (in tripe or) without hair.

In *Auvergne* they compose their pits with a Lye of Ashes, mixed with quick Lime, and they make three pits of one month each. In *Limousin* the pits last six months, and are composed of Lime and Ashes. In *Lauguedoc* the pits last eight or ten months, and are also composed of Lime and Ashes. In *Champagne* and *Luxembourg*, they allow from fifteen to eighteen months to a pit, replenishing it now and then with a small quantity of Lime. In *Dauphiny* they make four pits successively; they use more Lime than any Tanners in *France*, and their Leather is the worst.

Each Tanner in *France* follows the practice of his Father, or the experience he has acquired; it appears, however, that the great number of pits signifies nothing, and only produces an extraordinary expence in Lime and Ashes. The Hides will raise or swell only in a certain time, beyond which, they will be burnt or dried up. They grow as thick in three or four pits, as in six or a dozen.

Another very good Method is as follows,

Suppose the Stock of Hides to be 128, all strong gross Hides, take 16, the one-eighth of the whole, and dip them in the pit; this pit being refreshed for four days, will serve during four days as a fresh pit; and thus 128 Hides may be twelve hours in this pit, 16 at a time, or the first 16 may be suffered to remain somewhat less, and the last 16 somewhat more.

The pit which, during four days, has served eight times as a new pit, will serve eight days as a second pit for 128 Hides; each parcel of 16 Hides will pass twenty-four hours in the pit; it will also serve as a third pit, or a weak pit, for eight other days; it will serve for a pit for peeling, or a third dead pit for eight days; it will serve for a saving pit, or a second dead pit, during eight days; it will also serve for a dead pit for 128 others, for eight days; then the liquor of this pit, which has served in six different qualities for six times 128 Hides, in the space of forty-four days, being spent and good for nothing, is cast out; the fifth is emptied into its place, and so of the rest; the fresh pit is by that means emptied, and is renewed as before mentioned.

In

In this manner of managing the pits, we see, that of the 128 Hides, there is never more than 16 at once in the new pit, and that for only twelve hours in four entire days; in all the other pits they are seven times as long in the retreat or pile as in the pits; there are four pilings, three of which are of 32 Hides, and one of 16, so that of the 32, 16 are one week above, and one week under the 16 others; this order is observed as well before as after the hair is taken off.

The Method of Polishing, or taking off the Hair.

The Hides are known to be in a proper state to be shaved, when by pulling the hair gently with the hand, it comes off without any great resistance. This commonly requires two months in the dead pit; but antecedent to this operation, they are left in pure water twenty-four hours, after which they are rinsed and laid upon the beam. A round or semicircular knife (or a sharp stone, which is rather better) is used for this operation.

Sand is also necessary to assist in this work, but it must be the finest of river sand; when this cannot be had, sifted cinders and ashes are substituted in its place; this last requires many careful washings and rincings to discharge it from the Hides, whereas the sand by its gravity is readily discharged and washed off.

Whether the knife or stone be used, great care must be taken that no inequalities lie between the Hides and the boards of the beam.

As soon as the Hides are shaved and rinsed, their quality may be known; the best are when the white veins appear; these prove that the vessels of the Hides have been properly discharged, without prejudice to the Hide; they are then said to be Hides in tripe, because they resemble the intestines of animals, both in consistence and colour.

Mr. *Desbilletes* says, that Ox-hides, as soon as they come to the Tannery, should be sprinkled on the hair side with powdered broom, gathered in the second season, and being left in that state three or four days, the hair begins to fall off, especially if ashes are cast on them to facilitate the operation.

Mr. *Desbilletes* also says, he has learned from *England*, that the best method of taking off hair or wool from raw hides, is to make a strong decoction of * green broom cut fine, or of common thorny broom, if the green broom is not to be had; and the Hides or Skins being steeped in this two or three days, the hair or wool may be plucked off clean, without the help of Lime; by this method the Hide is secured from the injury of the Lime, and much time is gained.

The

* As most parts of *Ireland* abound in green broom, this experiment, which must contribute so much to the good quality of the Leather, appears worthy of attention.

The Conclusion of the Pit-work.

The Hides being cleansed from the hair, are put into a weak pit, that is, into a pit that has been often used, as before described; they remain here four months, during which time they are in and out successively, eight days at a time; some take them out and put them in oftner; the Hides are still better for this repeated operation.

After four months they are taken out of the weak pit, and put into a new pit composed of two barrels of live Lime, flacked with a sufficient quantity of water; they are taken out and piled up after eight days, and so remain eight more; and then eight days more in the pit, and so on for four months longer.

Every time the Hides are taken out, the Lime must be stirred about with poles; whilst the Lime is agitated and in motion, two men with long pincers drag the Hides one by one, from end to end of the pit, and then pile them; this is done that all parts may be equally covered with the Lime; when this is done, the Lime subsides, and the water remains perfectly clear.

The Hides have now been in three pits, viz. a dead pit, a weak pit, and a live pit, in the space of ten months; and the year is completed with another live pit; they are managed in this pit just as in the three preceding, for the space of two months.

To give an idea of the exact quantity of Lime necessary for a pit, I will suppose a barrel of
Lime

14 THE ART OF TANNING.

Lime to be 22 inches in diameter, and 32 inches high, its solidity will be 1216 cubic inches, or about 8 feet and a half, and it requires 2 barrels, or 17 cubic feet of Lime for a new pit of 80 Hides. These are sometimes divided into 4 piles of 20 each, that is, 20 are put into the pit for two days, when these are taken out, and 20 others are put in, and so on; thus all the Hides in the space of eight days, have been two days in the pit, and six days in piles. Every two months the pit is renewed with 2 barrels of Lime when a new pit is required; or it will serve for the two following months as a weak pit, without any additional Lime, after which it is called a dead pit, and only serves to prepare the Hides for the shaving off the hair.

Of the River-work.

The Hides having been a year in these four pits, are softened and filled as much as necessary; they are then to be fleshed and to be successively watered and beamed, that is, to be scraped on the beam with a blunt knife of a semicircular form, to press out the Lime, and then to be rinsed in the river, and so on alternately. This gives the Grain to the Hide, renders it supple and better prepared to receive the Tan; this pressing and rinsing must be continued till all or most part of the Lime is extracted; those raised with barley, require more rinsing and washing.

Of Pigeons Dung and ether Matters added to the Lime, by the English Tanners.

We have shewn before, that in France they add a certain quantity of Ashes to the Lime, whose
alkaline

alkaline caustic corrodes the Hide, and causes the hair to peel off. Many other ingredients would produce the same effect, but the best are those that raise or fill the Hides soonest. I have lately seen a great Tannery at *Oxford*, where they also used Lime; the Hides were but three weeks only in the pits, and after they had been beamed and watered, they were laid eight days in pigeons dung, but each day taken out for half an hour and piled up; there are some leave them in this dung fifteen days or three weeks.

Pigeons dung softens the Hides hardened by the Lime; it gives them a colour, it dilates and prepares them for the Tan; they put a measure of this dung, containing 6 inches in height by 10 inches diameter, to every 12 Hides; it costs about 16 or 18 *French* sols (of *Paris*) a bushel *English* measure.

Among Mr. *Desbillettes'* papers, written in 1665, I found a method of preparing Hides, which is remarkable, and absolutely forgotten in *France*, but not in *England*. Take, says he, fresh water sufficient to steep your number of Hides, add from 4 to 6 *boisseaux (each boisseau 66 $1\frac{7}{8}$ cubic inches) of green broom minced small, or even of green fern; of dogs dung, pigeons dung, and hen-house dung; let all be mixed together, stirring them up; let them soak together for forty-eight hours, then let the Hides be all put in together for forty-eight hours, after which they are beamed

* A boisseau is the *French* Bushel, about a peck and half of *English* measure. Twelve boisseaux make a septier.

beamed on the grain side, then having made a liquor of grain, and some of these ingredients well beat and bruised ; steep the Hides during twenty-four hours, and stir them about well at the beginning.

This liquor of grain is sometimes made with hot water, scattering some of the drugs on the Hides, of which we shall speak hereafter ; or some other ingredients, such as the tops or branches of oak, chesnut, birch, or the shrubs themselves of three or four years old, well dried and ground.

I found also among Mr. *Desbilletes'* Memoirs, that Colonel *Doughty* had brought from *England* forty-five years before that, a secret which he said was of his own invention. This secret was practised at *Paris* and at *Châtelleraud*, by a Company who had the King's Patent for this Art of Tanning throughout *France*. This secret consisted in what they called a * Confit, and is thus made : Take Broom in the spring at a dry season, while it is green at foot, from the month of *March* to the beginning of *June*, or even in the second season, from the month of *August* to the month of *November*, but the spring is best ; the pointed broom may also be used, but it is not so good as the green broom. This being dried and laid up in a dry place, is then bruised in a Tan-mill, or in a Mortar, or cut small by hand. When a hog-head full is prepared, empty it into a vat, on which pour clean fresh water, sufficient to cover 20. dozen of Calves Skins ; let the broom be steeped four days, adding a little dung of dogs, hens

* The *English* call this Masterings.

hens or pigeons, until the water becomes reddish and strong ; pour the liquor through a wicker basket to separate the broom, take half a * boisseau of quick Lime, slack it, and mix it with clean water apart, then run it into the broom liquor, mix all well together, and throw in the Skins ; they must be taken out every two days, and when out, stir about the Lime ; continue this for seven or eight days in summer, longer in winter, after which they are to be *fleshed*. Being *fleshed*, replace them in the *Confit* eight days longer, after which they are taken out to be grained ; in fine, they are put a third time into this confit liquor, and are then *fleshed* a second time, after which they are cleansed and put into the Tan Vat.

To make this Tan Vat for 10 dozen of Skins, add hot water about two-thirds full, throw in half a Muid of Tan ; let the Skins remain there eight days ; the first day stir them, placing the upper ones undermost, and *vice versa* for two or three hours ; the second and third days they are not stirred about, but are taken out and laid on a plank for some hours ; they then are left in the Tan Vat for some days.

After the first eight days of Tanning, the Skins are put into a second liquor, prepared three days before ; in this Manner, take a Muid and a half of Tan, put one half into the water, lay in 4 or 5 Skins, cover them with a bed of Tan, and so on alternately ; the Skins remain one month in this liquor. We may, says Mr. *Desbilletes*, put into this Vat powder of Bittany, of Raphanus Mari-

* This measure has been already explained.
nus,

nus, of White-pepper, of Sumach, of Gall-nuts, or of Ginger ; they give a firmness and a grain.

At the end of a month, the Skins are put into another Vat, composed of the same kind of liquor, but weaker ; the Skins are taken out every day, and are immediately put in again, lest they be stained or spotted ; at the end of three days they are put into stronger water, with Tan laid between each Skin ; this strong liquor is changed two or three times, until the Skins be completely tanned, which commonly require a month ; they then hung in the shade to dry.

Cow hides being stronger than Calve Skins, require double the time ; and in winter from *September* to *March*, all the intervals before-mentioned must be doubled. Observe that Broom mixt with the Lime to peel off the hair, diminishes the corrosive quantity of the Lime.

Ox hides require a stronger liquor than any others, and more astringent ingredients ; Birch Trees of three or four years old must be used, or the small branches of Birch or Chesnut ; the Birch makes the best leather ; it is still best if the rind of oak be mixed with the Birch, but they need not be ground so small or so fine, for gross Hides, as for Calve Skins or Cow Hides.

Of the Effect, and of the Danger of Lime.

We have shewn that Hides must be wrought in Lime one whole year ; in order to raise them, make them thin and tender, without the risk of putrefaction ; the Lime Water dilates them in effect, but at the same time eats and corrodes them ;

them ; it produces in the space of one year, what might be obtained in one month by other means. Lime renders the Leather stiff, hard, and brittle ; when this Leather is wrought into Shoes, it soaks the wet, and is very difficult to be dried ; it relaxes again in wet, and extends itself like a sponge.

Before the Reputation of *English* Hides, and those of *Liege, France* supplied great part of *Europe*, and it was a very advantageous trade ; the old people yet remember this trade in great prosperity ; to what cause then is this sudden change owing ? The use of Lime is undoubtedly the reason that this valuable Manufactory is brought to discredit in *France*, and the *French* alone still persist in this pernicious method ; Lime is corrosive ; it burns the Hides to that degree, they often tear or break in the handling and fleshing.

When the Hide is burnt by the Lime, Tan, which is only an astringent and a dryer, by no means repairs the fibres already half destroyed ; it can only strengthen those which remain unhurt, by expelling that moisture which relaxes and disposes the Hide to corruption. The *English* dress their Hides with Barley and Ouse, without the assistance of Lime ; it is only by imitating them we can recover that trade and its balance, which is entirely in their favour at present.

All Tanners are sensible that Lime damages the Hide ; for this reason, the Hide is always watered when taken out of the pit, and in some places the Lime-pit is so far spent and so old, as to require a long time to take effect.

I know

I know but of one sort of Leather where Lime makes the whole preparation, and that is for Circles of Spectacles, Snuff-boxes, and such like things. This Leather in the Hide is like a large sheet of thick Parchment. A Hide of this kind which weighed 80 pounds in the hair, costs in *France* about 50 livres.

Of Bark and Tan-Pits.

The Hides being raised by the Lime-water, and having undergone a fermentation, which has dilated the texture and spread the fibres, and being deprived of that natural Gum which absorbs moisture, are then in a state fit to be tanned, that is, to have their fibres strengthened and reunited.

Tan is therefore only an astringent and drying powder, by which leather acquires a necessary strength and durability; the Bark of young Oaks are commonly used to make Tan.

The young Oaks are peeled of their Bark at that season when the buds begin to open, and the sap to rise, the bark is then most easily peeled off the trunk and branches. This season is about the middle of *April*, earlier or later according to the temperature of the year, and the situation of the place.

By the King's Regulations, no Royal Forest can be barked while the Tree is standing; it is true, that when the Tree is barked and left to the time of next Sap rising, the Trunk is damaged, and one half of the Sap, at least, is lost to the produce of the Tree; yet when the Tree is cut
down

down immediately after having barked it, the Trunk receives no injury, and the Root will shoot out afresh.

The wood thus deprived of its bark is only fit for fuel, and is also much inferior to new wood in the bark, for it burns quicker, it blazes much, and heats less, as it is full of chinks and flaws, and is much drier.

Bark is composed of certain vessels conspicuous to the eye, which contain the resinous astringent quality of the tree; these are chiefly in the middle rind; the exterior coat is commonly dry, dead, and earthy, and the inside coat contains the ligneous or woody fibres.

The best Bark for Tan is white on the outside before it is ground, reddish within, rough and dry on the inside, brittle and of a flesh colour, smells of the sap within, and keeping that smell when it is ground; that which is cut and made up in bundles, is preferable to that which is folded.

In *France* we think Bark should be taken from young Oaks, from ten to twenty years growth, at most at thirty years. We reject such Bark as shews its great age by the cracks and crevices on the outside, or such as is taken too near the root; when black within, it proves it is too old, or that it has suffered by rain; if too red within, or has lost its smell, it is a sign it has lost its quality also.

Ground Bark is esteemed bad when too red; if it is foul or dirty; and if it appears stringy, or thready like hemp.

The

The Grinder or Miller should observe that all is equally ground and broken ; for if any should be flattened or squeezed, and not broken, it can only produce part of its tanning quality.

The price of Bark differs in the several Provinces, as there is a scarcity or plenty of wood ; in *Lyonnais* and *Bresse*, it costs 3 livres the hundred in powder, or thereabouts ; the Grinders have 8 sols for grinding a sack of 130 pounds.

About *Paris*, it is sold in parcels, a *Cavalee* contains five parcels, each parcel is five feet long, and about the same in circumference ; if it is ten or twelve years old, the *Cavalee* is worth 15 or 16 livres ; but from sixteen to seventeen years old, it is not worth more than 12 livres ; not because it produces less, but they say, the old has not the same strength, age rendering it less penetrating. Each parcel yields about 5 boisseaux of powder, and the boisseau weighs about 30 pounds, so that reduces the price of the powder to 48 or 50 sols the quintal ; it is yet cheaper in some places.

Some Merchants sell by a measure called the Muid ; each Muid containing from 104 to 124 Bottes or Bundles, and that quantity costs from 7 to 8 livres grinding in the Mill. Some years the manufactory at *St. Germain* employs (in its 200 pits) 6 or 8 thousand Poinçons of Tan, each Poinçon containing 216 *Paris* pints ; they pay sometimes 7 livres a Poinçon, which yields 200 pounds weight in powder, but the usual price is 3 livres 10 sols ; it is used half beaten or powdered, instead of being ground in a Mill. Cow Hides for second soals require a finer Tan, such

as brought from *Burgundy*, but the great distance makes this dear at *Paris*.

At *Nantes* the Bark is bought by the 100 fagots, each fagot at 20 sols, weighing 45 pounds, and the Bark when ground, stands them in 50 sols the Quintal. At *Rennes* they sell it in powder, at a crown a Barrel, weighing 50 pounds, which is 45 sols the Quintal.

The Tanners of *Besançon* require permission to fell their Trees to the 15th of *May*, contrary to the Forest laws, which require them to be felled before the 15th of *April*; they say, the sap is more retarded in that Province than in any other, on account of the coldness of the climate, and there may be some reason in this, as I have before observed.

About *Gray*, in *Frâche Comte*, they complain of the consumption of wood, made by the great number of Forges, and that they can get no Bark but of ten or twelve years old, which they say is too young to produce good Bark; this agrees with the opinion of the English, who use Bark of a longer growth.

In *Orleans*, the Rangers and Foresters have prevented the barking of Trees, and the Tanners are obliged to fetch it in powder from the neighbouring Provinces; these precautions are absolutely necessary at certain times.

In *Dauphiny* Bark is so plenty, that they send much to other Provinces; but this is seldom the case in any other part of *France*.

Some

Some Countries cut the Bark in Mills, by two posts shod with iron, falling alternately upon it ; these Mills are sometimes worked by water, sometimes by a horse ; others bruise it by a stone turning round, but some think this heats the Bark, and causes it to throw out some of its fire and weakens it : in fine, some Tanners cut it by hand, as those of *Britanny*, and yet the Bark costs no more than in other places ; it seldom exceeds 50 sols the quintal.

In *England* they use the Bark of the oldest Trees, as well as that of young shoots ; they bruise it with a Stone Mill, like a Cyder Mill, only the Stone is not quite so large, and it is channelled to have the greater effect in cutting the Bark. The Bark of old Trees is very subject to be dead, dry, and mossy, it must be carefully *scutched*, in order to take off the black and gross covering, which envelopes the red and live Bark.

Some Tanners build their own Mills ; in *Provence* they erect one for about 200 livres, and the expence of a man and horse by the year, amounts to 5 or 600 livres.

Bark reduced to Powder must not be kept long ; it loses its strength by evaporation, which carries off its balsamic particles, it also spoils by the moistness of the air, which dissolves the active and saline particles which should penetrate the Leather to produce a good Tannage.

Of different Substances which will tan Leather.

The dry and astringent quality of Oak Bark is found in many other plants, and although the Bark of Oak is the best and most common; I cannot avoid mentioning other materials which may be substituted.

I have heard it said, that in *Martinico* they tan Leather in six weeks, with the *Mangle* or *Mango* Tree.

Some of the *Calinou* Tartars who live near the great wall of *China*, tan Kid Skins with four Mares Milk.

In many places in *Turkey*, as well as with us, *Morocco* Leather is tanned with Gall Nuts.

In *Persia*, in *Egypt*, and in many parts of *Africa*, they tan Goat and Kid Skins, with the astringent leguminous Shrub, called *Acacia-vera*, gathered unripe.

The Nuts (Cones) of the Turpentine Tree, while green, and some say the Leaves also, as well as those of the Mastick Tree, are used in the *Levant*.

Sumac, *Rhus*, or *Smak*, is every where used for that Leather called *Cordouan* (made of Goat Skins) the *Arbutus* also is proper for this, as also the *Lote* or *Nettle Tree* (*Miscolier* ou *Celtis*.)

The *Tamariscus*, the *Rhamnus*, the *Rhus myrtifolia* is used in many Provinces of *Italy* and *Spain*; we shall speak of them hereafter. In *Swedenland*
C they

they use the bark of the smallest mountain Sallow or Willow, as also of the plant called *Uva Ursi*.

In *Silesia* they use a species of Myrtle called *Rausch*. The Bark of Birch is employed instead of Oak in divers Provinces of *Germany*. In *Sweedland* they use another Shrub called *Buxerolle*, in Latin *Arbutus uva ursi*. At *Vienna* and in *Hungary*, they never use Oak Bark, but a drug they call *Knoupreu*, and which I believe to be Gall Nut: This is the quickest and most durable tan known; it may be kept nine months without losing its virtue; very little of it goes to a pit, as they only scatter a small quantity on each Hide with their hands. A Cow Hide may be tanned with this in twenty-four hours.

I know not what method the *Chinese* follow, but their Hides are incredibly strong.

When the Tanners of *Provence* and *Languedoc* are pressed in point of time, they mix Powder of *Redoul* with their Bark; this apparently gives a firmness to the Leather, by which the Buyer is imposed on. This Plant is called by *Baubini*, *Rhus myrtifolia monspeliaca*, and by *Linnaeus*, *Cassia* (*myrtifolia*) *foliis ovato-oblongis trinerviis*; it is also called *Roudou*, and is described in the Memoirs of the Academy of *Paris*, for the year 1711. The Berries of this Plant causes an Epilepsy, sometimes mortal, if eaten by the human Species; its Leaves eaten by Kids causes violent Vertigos, but it does no mischief in the Tan Vat, and costs much less than the Bark of the Bastard French Oak. The Branches and Stalks of the
Redoul,

Redoul serves well enough for Basils and Goat Skins, for upper Leather of Shoes.

The Plant called in *Provence*, *Garouille*, at *Mountpellier*, *Avaiïsses* or *Avau*, has been described by Mr. *Nissole*, under the word *Kermes* (or Scarlet Berries, being the Fruit of the Scarlet Oak); it is named by Botanists, *Quercus*, (*coccifera*) *foliis ovatis indivisis spinoso-dentatis glabris*: *Linnaei Specierum*, p. 995. *Ilex aculeata cocciglandifera* C. *Bauhini Pin.* p. 425. *Quercus foliis ovatis dentato-spinosis, glandibus sessilibus*, according to *Sauvage*, p. 96.

The *Kermes* or Berries which renders this Shrub remarkable, is an excrescence caused by the deposit of insects eggs; there is an ample description of it in the *Memoirs of the Academy for 1714*, by Monsieur *Nissole*. He calls it in Latin *Coccus Ilcis*: the Syrop of *Kermes*, and the Confection *Alkermes* are composed of it.

It is only the Bark of the Root of this Plant which is used in Tanning, whereas it is the Bark of the Oak Tree itself makes the common Tan. This Bark of the *Garouille* or *Kermes*, causes a blackness in the Leather, whereas Oak Tan makes it red. The common name of the Bark of the *Garouille* among Tanners is *Rusque*.

This *Rusque* costs more than the common Bark; it burns the Hide more than Bark of Green Oak, but it tans in six months; and though it causes that blackness in the Hide, they say, it is as good as the green Oak Bark, but it is only a deceit in Trade, for certainly there is no substitute so good.

There are many provinces in *France* use the green oak, of which there are two kinds indistinctly used at *Montpellier*, either for sole or upper leather.

1. *Quercus* (smilax) *foliis oblongo-ovatis subtus tomentosis integerrimis*. Linnæi Specierum. *Ilex folio angusto non serrato*. Casp. Bauhini. Euze. Green Oak, or Jeuze.—2. *Quercus* (Ilex) *foliis ovato-oblongis, indivisis serratisque cortice integro*. Linnæi Specierum.

This Bark is ground and used unmixed; it is a principal article of commerce about *Montpellier*, and is sold from 50 sols to 3 livres the quintal. Strong hides and sole remain a year in this bark, as in that of common oak, but upper leather remains but two months.

In the new manufactory spoken of by Mr. *Desbillettes*, instead of oak bark, they use the small twigs of the branches of oaks, or young shoots of three or four years growth, because they yield more juice than the bark; they are gathered a little before the leaves put forth, that is, in the month of *April*, or somewhat earlier according to the season.

They use another preparing liquor made of oranges and lemons though ever so rotten, or either separately, grinding rind, pulp, and core together; this makes the best leather, and causes it to take the tan quicker; the hides are left in this liquor eight days, stirring them often before they are tanned.

Many

Many other plants are also used, and Mr. Desbilletes observes, when they are gathered, if they cannot be dried in the sun, they must be dried in an oven, as they are to be ground as bark; if they are not thus dried, a vicious juice will remain which will hurt and blacken the leather.

He adds, that as these plants have not so much strength as the common bark, there must be a greater quantity used, but he assures us, that by these plants the finest and best leather may be made.

Cow hides and calf-skins may be tanned with a liquor made of all sorts of heaths, brambles, black thorns, wild plumbs, and barberry trees, which must be cut, dried, and pounded; this liquor, adds he, tans the hides without corroding them, and in fine, we may use even the dog brier, and finish with *sumac*; but it appears to me impossible to collect a sufficient quantity of any of these to furnish a tannery of any size.

Mr. Desbilletes says, that to harden the leather, they put powder of the *raphanus marinus*, or else gall nuts (*noix de galle* is also an oak apple) and it is scattered on both sides of the hide when it is about a quarter tanned, four hours after it is laid in the pit: a second operation of the same kind succeeds, before the hide is perfectly tanned, if it appears not firm and smooth: this method, adds he, makes the best and finest of leather.

Mr. de Buffon declares that the cup of acorns will tan, and also oak saw-dust. This celebrated man's observations on forest trees and every qua-

lity relating to them are dispersed in many volumes of our memoirs.

It has been often mentioned by writers, that *Europe* will one day be in want of timber, and this opinion proceeds from the immense quantity daily called for in buildings and the mechanic arts; there are some places where it is already so dear, that the inhabitants actually burn it by weight and measure; where they cannot afford to work it up into vessels or casks, and are obliged to use the skins of beasts in lieu thereof; where manufactures most *interesting* to the state, cannot be established, because of the great consumption of this useful article. And there may come a time when the most polished and polite nations shall return to a state of ignorance and poverty, for want of timber, on which so many useful arts depend.

Mr. *Gleditsch*, a celebrated Botanist of *Berlin*, has with many other Naturalists, formed a scheme to save the consumption of oak to the *German* states. In the Memoirs of *Berlin* for 1754, he gives instructions for the use of plants, that will tan instead of oak bark: On the hints given by Mr. *Klein*, a most laborious and ingenious man, he made several experiments, they succeeded, and he acknowledges the ideas of Mr. *Klein* as a real and valuable discovery. Leather was produced, prepared, and tanned without the assistance of any kind of tree, or foreign drugs; excellent goat skins were prepared without fumac, and two sorts of calve skins tanned with the simple leaves of trees.

These

These gentlemen used those plants which are common in most marshy soft soils, such as are in general refused by animals as food, and which nature seems to intend purely as ornamental; in short, such as are generally found in solitary and inaccessible places.

Such plants as are fit for this purpose, as do not contain terrestrial, resinous, and gummy particles, but have oily and vaporous particles; Mr. *Gleditsch* divides them into these two classes accordingly.

The first class are astringents sharp, and without smell; which have active but fixt principles; the earthy parts are about one third, and sometimes one half, the gummy parts about as much; the resinous parts are the least, not being in general above one drachm in a pound.

The second class are those which have volatile particles; a spirituous principle, partly balsamic, and partly unctuous, and have fewer fixed particles; but of all these plants, the best for tanning are those which are chiefly composed of a gross, astringent, acid substance; the fat and mucilaginous are the worst.

When the fixed substance of these tanning plants is destroyed by fire, a pelucid and non-astringent empyreumatic phlegm is obtained; an acid yellow liquor with an empyreumatic oil. The *caput mortuum* often makes half of the whole, and contains some portion of fixt alkaline salt.

All plants fit for tanning being reduced to powder and thrown into a solution of iron, with oil of vitriol, should produce a reddish blue or blackish colour.

By knowing the contents of the principles of these plants, Mr. *Gleditsch* was led to pronounce the effects they will produce on leather: The acid being dissolved and mixed with water, and put into motion with the volatile, oily, and balsamic particles, penetrates and condenses the skin, gives it strength and preserves it from corruption.

Plants require no mill-work, it being sufficient they should be grossly cut or pounded. Yet I must confess my opinion, that of all this multitude of plants which may tan, there are none do it so effectually as oak bark. I doubt even if a sufficient quantity of them could be obtained in the same abundance; however I shall give a catalogue of them from Mr. *Gleditsch*.

Plants whose leaves, branches, fruit, seed and sometimes their roots may be used in tanning.

Vine branches.

Prunus Sylvestris (Wild thorny Plum) the bark and fruit before ripe.

Salix vulgaris alba (Sally) the branches and leaves.

Salix caprea rotundifolia Taberna (Water Sally) the leaves, bark, and branches.

Sorbus aucuparia (the Service Tree) the branches, leaves, and fruit, when green.

Leaves of the Rose Tree.

Fagus

Fagus (the Beech Tree) the leaves and bark.

Carpinus (the common Hornbeamed Tree) the branches, leaves, and bark.

Oak leaves.

Alder Tree, the leaves.

Mespilus, (the Wild Medlar;) the leaves, branches, and unripe fruit.

Ledum Rosmarini folio Tabernæ; *Rosmarinum sylvestre*, (Wild Rosemary) the branches. This plant is not common.

Cornus sylvestris mas, (Cornel Tree) the leaves, branches, and seed.

Acetosa pratensis, (Wild Sorrel) the root and seed.

Lapathum maximum aquaticum, (Great Water Dock) the leaves, roots, and seed.

Lapathum folia acuto plano, (Water Dock) the leaves and seed.

Iris palustris lutea, seu *acorus vulterinus*, (Aqua-tick Flower de-Luce,) the root.

Nymphaea lutea, (white and yellow Water Lilly) the roots only.

The bark of Chestnut, Poplar, and Hazle Tree may also be used.

Plants whose flowers only; or the leaves with the flowers, may be used in Tanning.

Salicaria vulgaris purpurea foliis oblongis; sive *Lyfimachia spicata purpurea* sorte Plinio; (Purple-spiked Willow-herb, or Lofestrise.)

Ulmaria, (Meadow-sweet.)

Quinquefolium palustre rubrum, (red aquatick Cinquefoil.)

Felix ramosa major pinnulis obtusis non dentatis, (Female Fern.)

Filix non ramosa dentata, (Male Fern.)

Filix palustris maxima, (great aquatick Fern.)

Filix mas aculeata major & minor, (the greater and less sharp Fern.)

Periscaria salicis folio potamogeton angustifolium dicta, five *Periscaria acida Jungermanni*, (Arsmart) they grow both out and in the water, but somewhat different in their shape.

Bistorta major radice intorta, (Bistort or Snake-weed.)

Tormentilla Sylvestris, (Tormentil.)

Pimpinella sanguisorba major, (Burnet.)

Cariophyllata vulgaris, (common Avens.)

Caryophyllata aquatica nutante flore, (aquatick Avens.)

Argentina, five *Potentilla*, five *Anserina officinarum*, (Wild Tansey.)

Quinquefolium majus repens, (the greater Cinquefoil.)

Quinquefolium minus repens luteum, (lesser Cinquefoil.)

Quinquefolium folio argenteo, (white Cinquefoil.)

Thorminum pratense foliis serratis; five, *Scalaria Tabernæ montani*, (wild Clary.)

Agrimonia, (Agrimony.)

Equisetum arvense longioribus setis, (Field Horsetail.)

Equisetum palustre longioribus setis, (aquatick Horsetail.)

Alehimilla vulgaris, (common Ladies-mantle.)

Muscus pulmonarius, five *pulmonaria officinarum*, (Lung-wort.)

Muscus quernus, (Oak moss or Oak lungs.)

Lysimachia lutea major, quæ *Dioscoridis*, (Loosestrife.)

Vaccinium Rivini, *Vitis idæa foliis oblongis crenatis*

natis fructu nigricante, (Black Whorts, Whortle-berries, or Bil-berry.)

Vaccinium foliis buxi, semper virens, baccis rubris, (Whortle-berry)

Rubus vulgaris seu fructu nigro, (the common Bramble.)

Rubus repens fructu cæsis, (lesser Bramble.)

Fragaria vulgaris, (common wood Strawberry.)

Filipendula, (Dropwort.)

Pervinca Tragi & Tournefortii. Clematis daphnoides, (Periwinkle.)

Sparganium, (Bur-reed)

Filago, seu impia, Dodonæi, (common Cudweed.)

Gnaphalium montanum flore rotundiore & longiore, (mountain Cudweed.)

Geranium sanguineum maximo flore, (bloody Cranes-bill with a large flower.)

Geranium batrachioides maximum minus laciniatum folio aconiti, (mountain Cranes-bill with a crow-foot leaf.)

Plantago, (Plaintain :) all species are good.

Hypericum officinarum, (common St. John's wort.)

Of the Pit work.

The pits are cavities made in the ground, in which the hides are laid with the tan; these pits are either round or square, made with timber or masons work; they were formerly lined with wood, and their figure square, which seemed more proportionable to the shape of the hide; they are now in France commonly made of a round form, like unto vats, made after the same manner with flight timber and hoops; some make the bottom

larger than the top, that they may resist the earth the more.

Before the hides are pitted, some sprinkle their bark with water, and stir it about with a shovel, that it may not be blown away, but the powder is more equally divided when dry.

The hides being raised, fleshed, watered and drained, are fitted to be pitted, with the bark which is to strengthen and tan them.

In *Auvergne* they divide the hide in three parts before it is laid in the pit; the middle part, or the strip of the back is about a foot broad, some even cut that into two equal parts.

The hides are sprinkled with bark, and piled for three or four hours, that they may take the fire of the bark before they are laid in the pit.

The bottom of the pit is covered with bark which has been used, six inches thick; over this is laid fresh well ground bark one inch thick, being a little wetted; on this powder the hide is laid, over this another lay of powder, and thus alternately.

Some cut off the forepart of the heads of the hides, and lay them separately, to give them more bark on account of their thickness; sometimes the hides are cut across each half, that they may lay the better on the tan; the extremities of the hides that are wrinkled or bagged must be slit, that they may the better be extended; bark is put between each part of every hide, and when it is folded, bark is also put in the folds; adding
more

more on the thickest parts; the thickness of a finger is sufficient for the thinnest parts. A distinction is to be made between the three powders as to the thickness and quantity of bark: the first put into the pit, must be somewhat more than an inch, the second one inch, and the third somewhat less.

Some are of opinion that the tanning ought not to be done with fine powdered bark, but gross, that is a degree above powder, for the first bark; in the second a little grosser, and the third still more: it appears to me, that the only advantage of this method is a saving of expence; for the finer the bark is, the more is consumed, it penetrates the hides better, the sooner it waxes itself, and the more the hides profit by it; therefore, I think this method ought to be exploded.

At *Bâle* they tan with grosser bark than in *France*, and in moister pits. In *England*, they tan in water itself, as I shall hereafter shew; but at present I am treating of the general method followed in *France*.

All vacancies or hollows in the pits not filled with hides, must be filled with old bark to save the new; in order to make fewer spaces, the hides, or the halves if they are cut across each other. Each hide when laid in the pit is well trampled with the feet, that it may lay closer on the bark: the more compact the hides the sooner the bark will penetrate.

It requires about two hours to fill a pit of fifteen or sixteen hides, after the manner I have described: when the pit is nearly full, and the last hide

is covered with new bark, a foot or two of old tan is well stamp'd on the whole to make a covering; boards are placed over them, and stones over the boards, to press all together, and to cause the bark to penetrate the better.

The pit being thus covered, clear water is poured into it in such a quantity that in the space of a day it may not be thoroughly soaked up, and that next day some may appear on the surface: it requires for every two hides a pail of water containing three cubic feet or about one hundred pints of *Paris*. In some places they are much oftner watered, and they found them from time to time to know whether they are not too dry.

Hides are tanned with three barkings; the first barking is on the grain; it must be fine, to prevent their wrinkling and becoming uneven; this first barking continues three months.

The second is given on the flesh side, but not so fine as the first; this ought to continue four months, for in less time they will not be tanned in the middle of their substance.

The third barking is on the grain; and in grosser powder than the second: this continues five months, which compleats the year; the tannage has now produced its utmost effect. Sometimes for greater perfection a fourth barking is given, and then the hides may be left longer if thought necessary.

Each time the bark is changed, the hide is swept, beaten, and shaken, that the old bark may

may not prevent the flesh from casting its fire into the hide.

Those that tan great quantities may fill their pits with hides of the same degree of tanning; that is, one entire pit may serve for the first barking; another whole pit for the second, &c. But this is impracticable with those who have not such quantities; they are under a necessity of putting part into the same pit hides of a first, second and third barking; observing to place at the bottom those of the last degree that are most advanced in tanning, and so on with the rest, to those of the first barking, which fill the upper part of the pit, and are reserved to go down in their turn.

But as the water which is poured on the bark, always subsides to the bottom of the pit, and carries with it the most active part of the bark, so at the bottom the hides are most forwarded; and for that reason, when in a pit where all the hides are of the first barking, and they intend to lay a second barking in the same, they place those at the bottom which were at the top, that all may at length be equally tanned.

This moisture so essential to the business, and which ought still to be increased, is sometimes deficient by the leaking of the pit; the hides then remain almost dry, which prevents the tan from having its desired effect; and as it is of the greatest importance that the pits should be staunch, they should be frequently sounded and tried. Yet they must not be opened without necessity, for the air, sun, frost and wind retard the operation of the tan.

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The quantity of bark varies according to its quality: the account we received from *Languedoc* allows four times the weight of the hides; that is, two hundred pounds of bark is given for a hide that weighs fifty pounds: which is somewhat more than is used in and about *Paris*.

At *Sedan*, the three barkings consist of 85, 75 and 65 pounds, that is 225 in the whole, for one hide which when green weighed 100 pounds, and when dry 50.

In *Bresse*, where ox-hides when finished, and fit for sale weigh commonly twenty-three pounds, they seldom use more than thirty or forty pounds of bark at the first barking of each hide; the others in proportion.

Hides raised or swelled by barley, generally require about a fifth more bark than those raised by lime.

At *Sedan*, for a hide prepared in four liquor, (that is, with barley,) and weighing green one hundred weight, they allow eighty-five pounds for the first barking, seventy-five for the second, and sixty-five for the last, as we have before described: Yet some tanners say, that hides prepared with lime require a fourth barking, that is, three or four months longer in pit than hides raised by barley; this probably happens from the red workings or binder given to hides filled with barley, which disposes them sooner to receive the saline particles of the bark.

In tanneries where hides are prepared with liquor of bark (or ouze) the first barking is ground very fine, because it is not to be used out of the pit: the two other powders (which when taken out of the pit, are to be made use of for scouring liquors) are grossly ground; yet the tanning would be more perfect if the bark was equally fine.

I have already observed that when the tanning is only carried on for the space of one year, that the first pitting, or first barking continues three months; the second four and the third five months. Experience has proved that hides are much better for being kept longer in the last barking than in the first; the reason is obvious; a hide newly laid, greedily and quickly sucks up the nutritive substance of this bark, and when thus deprived of its active parts, its continuance on the hide would add no more to its quality; on the contrary, in the last barking the hide being already in some degree tanned, is more compact and hardened, and the tan requires a considerable time to inject its fire, and to divest itself of all its salts; the hide cannot be hurt in this state, though it might in the first bark, where it was not yet sufficiently tanned, to be secured from corruption, or the fermentation of the animal parts.

In *Burgundy* it was enacted, in 1349, that ox-hides should be laid in three barkings of three months each, in order that the hides might be well tanned; cow-hides to have two barkings, the first of three months, and the second of four.

In *Auvergne*, they give three barkings, of four, five and eight months. In some parts of *Langue-dox*, they give but two barkings, each of half an inch thickness, which last ten months or one year. In *Champagne*, the tannage is continued fifteen or eighteen months, in some places it is considerably abridged: in *Limousin* there are some who lay their hides but two months in pit; this is an abuse worthy of the inspection of the magistrates, and which has been forbidden by the laws of *France*.

Some hides necessarily require a fourth barking of forty pounds for three months, after the three common barkings, these are hides that are stubborn by nature, dry and poor, and those which may have failed in the scowerings. On the contrary there are thin hides which require less bark than others.

When hides want thickness and firmness after the two first barkings, it is remedied by scattering half or three quarters of a pound of powdered alum among the last barkings, which is to be strewed all over the pit: this was one of Mr. *Teybert's* secrets; and if this commodity was sufficiently common in *France*, it would be of great advantage to the tanners.

The English method of Tanning.

The pits used in *London* are carefully lined with wood, so as not to let the water leak, and are kept constantly full: they put in at first, two baskets of bark, that is about eighteen *Parisian* bushels

to

to a pit of fifteen or sixteen hides; but they add more at different intervals.

They first place the hides in a pit almost spent, where they remain one month; after this in a second, third, and fourth, in which they continue three months: lastly in a fifth pit, where they lie one month without being stirred: there are cisterns or waste wells, on the side of each pit, to prepare the first liquors, and to water the hides.

In the second, third, and fourth pit, the hides are taken out every eight days, and cast again with the addition of two baskets of very fine bark, divided and distributed amongst the hides, without folding them, but promiscuously throwing them into the water, with bark over them.

At *London* the total of these operations is finished in a year at farthest: if there should be any hides more difficult to be tanned than others, they are suffered to remain longer; but I have been assured it never exceeds eighteen months or two years, though it is thought in *France* that the English tanners employ more time.

That one man may the easier manage a great number of pits, containing each twenty, thirty, or forty hides, more or less, the date of their being put in pit are marked on sticks, and the number contained; these sticks are afterwards put into the pit and consulted occasionally.

This method of tanning in *England* in bark liquor or ouze, (and not in bark almost dry as in *France*,) is perhaps the reason of the considerable advantage their hides are said to have over ours:
the

the water which continually keeps the most penetrating and styptic parts of the bark in the state of solution, must penetrate the hides with more facility than powder or the mud of the bark, which is only spread over them: and I appeal to the experience which every tanner must have of the goodness of *English* hides, to be justified or condemned in my explanation. Arts have been so little studied and known hitherto, that even the most positive facts are contradicted and rendered equivocal by self-interested men, and I doubt not, some tanners will even aver that *English* hides are not better than the *French*.

Of the time required for Tannage in France.

Some tanners who appeared to me to be sincere and more instructed in their profession than others, agreed that hides ought to be left much longer in the bark than is commonly practised in *France*, and that thereby they would acquire more quality and strength; several are also convinced that those excellent hides from *Liege* and *England*, which pass for the best in *Europe*, have remained three years or more: I have known some maintain that the preparation of a good hide in *England*, lasted sometimes six years, and that formerly in *France* they took up that time.

Some nevertheless maintain, that even in that, there is an excess to be avoided, and a point of saturation, when a hide cannot avoid losing by remaining in the pit: that there is a greenish colour to be perceived in the middle of the hide when cut, which would not remain had the hide been too much tanned; instead of this, which
ought

ought to shew in the midde of the cut, is found, a dry, hard, horny substance, which on one side is easily penetrated by wet, and on the other renders the hide very brittle.

If it be true that bark is subject to such an inconveniency, it must be allowed that in the present practice the interest of the tanners will free us from this kind of bad leather; perhaps the desire of hastily finishing their work, has never permitted them to try the experiment; and they are too much pressed to get in their stock. If there are hides from *Liege* which remain so long in pit, they are those brought from the islands, which being of a quality different from ours, may require a longer time in the bark; but it is certain the method of tanning almost dry in *France*, is more tedious than that of tanning in liquor, which in *England* requires but one year.

Method of shortening the Tannage.

A method of shortening the tannage has been long wished for and often tried; the profit thereby would be considerable, since on sixty hides there is a loss of seventy-two livres a year on the interest of the capital stock, and the ground each pit occupies is equally expensive to the tanners, especially at *Paris*, where the rent and cost of a tannery is a considerable charge: here is an expedient that borders on the *English* method, and which might considerably abridge the tannage. It is known that the re-steepings forward the lyes, and that the liquor of the tan forms and perfects itself by being often repassed on the same dregs; a cistern or drain well might therefore be made with

with two boards at one corner of the pit, to introduce a pump : by this means the filtrated liquor from the tan might be pumped out when gathered in the cistern, two or three times a week if necessary, and returned into the pit : these repeated filtrations would be a sure means to draw the substance out of the bark, to dissolve all the salts, to imbibe and penetrate the hides therewith, to keep them always soft and open, till the tan had penetrated and soaked them properly : experience would soon teach at what time it would be proper to put an end to these filtrations and refillings, and it appears that much time would be gained by following this method.

I am sure a considerable advantage might also be gained by heating the water of a pit ; warm water dissolves, softens, and penetrates much better than cold : we have already sufficient proof of this on small skins.

I have heard that M. *Teybert* mixt powdered alum with the tan he put in his pits : there is no manner of doubt but that it would greatly contribute to the firmness and strength of the hide ; but this commodity is perhaps too costly in *France* to be used in tanning : if there was a substance as astringent and styptic as alum, and at the same time as common as oak-bark, it would augment the strength of the hide, and abridge the tedious operation of tanning.

Of Drying the Hides.

The hides having remained a sufficient time in the pits, and being well tanned, are dried in the shade,

shade, without beating or sweeping ; for this purpose they are extended on poles, or else hung by the head on nails ; and that the air may have a free access on all parts, they are kept open by one or two sticks, extending the belly of the hide : for this purpose a loft is erected with many openings in it, but screened from the sun and high winds.

When the hides whiten and become stiff, but not thoroughly dry, they are dressed ; for this purpose they are extended on a clean floor, are rubbed with dry tan to take off the mouldiness, and trampled, particularly on the flesh side, to take off the inequalities, risings, and swellings ; they then are piled, observing to couple them head to head and tail to tail ; and then crossing each couple alternately, they are thus left for one day : if they are not of equal size, the small ones being soonest dried, are piled separately.

The following day the hides are put on the perches, unless not sufficiently dry ; if not, they are hung up for three or four days longer : when almost dry, they are pressed for twenty-four hours, that is, they are covered with planks loaded with weights.

Those hides that are puckered are malotted, that is, they are beaten with a mallet on a smooth block of wood : the beating helps to stiffen, to draw out and smooth them ; some tanners beat all their hides.

Being thus dressed, pressed, beaten, and almost dry, they are put into a cool place, and their situation changed from time to time for three weeks ;
sometimes

Sometimes they are piled, charged, or turned over; sometimes spread like a fan by putting the back on the edges; at the end of three weeks or a month, they are dry and fit to be used.

Though the hide be well dried, it is the better for being long kept; it should be one month in store at least, that all the active parts of the tan may finish their penetration; that all intestine motion may cease, which might tend to its dissolution, and prevent the duration of the leather.

Where hides are raised with lime they only sweep or brush the grain side, leaving the tan that sticks to the flesh side, to nourish the hide when it is folded: they are not beaten or tied, but are folded in two, the grain outward. In *England* they do not beat them flat as in *France*.

Hides raised or filled with barley, require more beating: when they are almost dry, they are extended on a stone well fitted for that purpose, surrounded by several men; each being furnished with a wooden mallet, and striking firmly to render them more compact and firm; instead of a beating stone some use a wooden block, each are equally good. Eight men can beat thirty hides in a day.

This dressing is of great service to the hide, and there is a considerable difference between the goodness of a hide well beaten, and that which has not been beaten: shoemakers who value themselves on the goodness of their work, beat their soles strongly and for a considerable time.

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The *English* tanners fashion their hides in the drying-loft after a particular manner, which answers pretty near the same for the goodness of the commodity: when the hides are extended on the poles, the grain being on the outside, they take a little mallet, rounded and made of very hard wood, with which they strike the internal parts of its surface with repeated strokes throughout the whole; by this means they give it nigh the natural shape of a bullock, and under this form they are fold. The same operation is repeated morning and night; and if the hides dry too quick, they are sprinkled with a broom, by which means they compress and harden themselves under the mallet.

Of the Texture of Hides and of their Quality.

Hides and all skins in general are composed of several lays of fibres, interwoven, in the form of a net; and which intersect in every direction; as I have observed in the art of making parchment: thus leather cut in all directions presents the same aspect, the same strength, and appears with its even thread on all sides; consequently its resistance is equal in length and in breadth.

Hides well tanned are of a long duration, and are not subject to corruption: shoemakers, have kept them for fifteen years, without their losing any part of their good quality; but they must be preserved from the inconveniency of moisture as well as too much dryness.

Merchants who buy large quantity of hides for the fair of *Beaucaire*, or such like places, wet
D their

their magazines from top to bottom, to preserve the weight of the hides. Hides will even augment in weight by absorbing the moisture of the air: this happens chiefly to *Hungarian* hides, which contain a great deal of alum.

To know if a hide be well dressed by cutting it, observe whether the cut be shining, the nerve close, if it is internally of the colour of a thorny gall-nut, or like the inside of a nutmeg, or if it be marbled within. The cut ought principally to be made at the throat, back, or towards the buttocks; these are the places to form a right judgment, because they are the most essential parts of the hide.

Those that appear tarnished on the cut, greenish or black, the nerve open, spongy, and a black or whitish streak in the middle, are ill-dressed. Those that shew horny in the cut, that are stiff, dry, and give a certain clear sound, have not been sufficiently tanned.

The tanners say that hides too much tanned are open, spongy, and light, are burnt by the strength of the tan, and appear all over of one brown colour on the cut; but this is rather to be attributed to the lime than to the tan.

The usual method to know an ill dressed hide is this, let fall a drop of water from the finger on the grain, or rather on the cut; if the drop does not remain perfectly round, but extends itself, it is a proof that the hide is badly tanned and spongy; but a hide must be very bad and very spongy to absorb a drop of water instantly. To distinguish it thoroughly, the hide ought to be steeped in water for some days, weighing it before, and

and at its being taken out of the water, one might then judge of its spongy quality by the augmentation of its weight, but it should first be ascertained how much water a hide of the best leather would suck up in eight days, or how much time it would require to absorb one ounce weight of moisture.

Of Hides raised or filled by Barley.

Having now described the most ancient and common method of tanning, I shall again take the work from its first operation, in order to explain the different methods made use of to attain the same end.

The first of the two great operations of the tanner formerly consisted in raising the hides, that is, to dilate and open their pores by the moisture of lime water, in order to facilitate the operation of the tan pit which was to follow: it has since been found that fermentation managed skilfully, and conducted with precaution, could produce the same effect in less time, and after a more perfect manner: this consists in souring a paste made of flour or barley, which is after diluted, and in which the hides are steeped: this sour water causes an acid fermentation in the hides, which dilates and rises them without burning or weakening them, as lime must.

This general method I shall divide into several branches, because it is practised different ways, and shall lay down successively all those which have reached my knowledge; after which I shall treat of hides raised by oak liquor or ouze, which

are prepared without barley flour, by means of a different fermentation.

Hides to be raised or filled by barley, are to be well washed from the blood if fresh ; the salt taken out if dry and salted ; they are to be softened by steeping, fleshing, and trampling, the same as hides filled by lime.

The river work must be well carried on for those raised by barley ; the water must come clear from them, and the gummy part be well pressed out, as it would hinder the fermentation in the barley workings or scourings, by enclosing with its mucilage, the insensible parts, whose intestine motion produces fermentation. I know that the first experiments of an eminent tanner failed, because of some glue that was in the vats he made use of.

When the hides are well soaked and softened, they are to be filled by means of the acid fermentation. It is well known that flour diluted with water, such as the common dough made for bread, is subject to ferment and grow sour ; that in this state the dough rises, swells, and heats ; such is the effect produced in the hides, by the means of barley diluted with water ; this is called barley workings (or scourings :) it is done in common vats four feet in height and four feet diameter.

It requires about one hundred or a hundred and ten pounds of barley for a scouring of eight hides, supposing middling hides weighing twenty-five pounds dry, or fifty green : some put in all the flour at once, when they are going to work the hides ; others make a leaven the day before with

with twenty-five pounds of flour and a caldron of warm water, and add the remainder of the flour twelve hours after; some add a small quantity of vinegar to accelerate the fermentation: three or four quarts of vinegar poured at different times on a scouring, certainly preserves the necessary coolness and acidity for a good fermentation.

Hides raised by barley are commonly cut in two before they are worked, whereas those done with lime are generally whole.

In some places the hides raised by barley remain in the scourings six weeks in summer, and three months in winter, before they are sufficiently filled: they are each day taken out for two or three hours, and put on boards placed on the side of the vat; this operation is necessary, as the contact of the air facilitates, and keeps up fermentation.

The preparation of these barley hides, at *Seegar*, consists of nine or ten little vats, containing about six hogheads; each of these vats has its different degree of strength; that which has been once worked becomes one degree inferior; and instead of being the tenth, it is named the ninth for the following hides: that which has been worked twice is called the eighth, and so alternately to that which having served nine times, becomes the first in the order of scourings, and is the weakest of all.

In the first barley liquor thus weakened, and which has already served nine times, five hides are cast in, which remain one or two days; from

thence they pass into the second vat, which is a little stronger, (that is, a little more four) because it has served but eight times, and thus of all the others which the same hides go through successively.

Sometimes the hides go through only the third or second vat, according to their degree of strength.

The four liquor of the first, and weakest of the vats, which hath served even ten times, is not always useless; as long as it seems sufficient for the first preparation, it is preserved, and so of the rest: this is not the case with bark liquors used to raise hides; they are not kept beyond the first time; and the lowermost vat which has been used ten times, is emptied (if ten vats have been made use of): I shall treat of this in the preparation by oak liquor, or ouze.

In several provinces they have but three vats for one dressing, of which they make three scourings, the dead, weak, and new, in this manner; the hides being sufficiently softened, are put into a dead working till they lose their hair; in the same manner as the dead pits only serve at first to take off the hair, so the dead scourings are used to dispose the hides for new scourings, and also to take off the hair.

After one or two scourings, the hair being disposed to come off, the hides are polished on the beam with a round knife, and then cast into clear water for twelve or twenty-four hours, as necessary. They are taken out of the water, and put into a weak scouring, where they are plunged
down

down once a day, until they appear to have taken a body, when they are fleshed; after which they are cast into water for the space of six hours; the workmen term this the soaking of the feeble.

The third scouring must be a new scouring, made up as before mentioned, of about twelve pounds of flour of barley for each hide weighing twenty-four pounds when dry: with one quarter of this flour a leaven is made, and when it begins to rise, which generally happens at the end of twenty-four hours, unless excessive cold retards the fermentation, it is diluted with the flour in a vat, containing as much water as necessary for the number of hides to be steeped: each day the hides are to be taken out of this new scouring and put in again, till they have acquired the swelling and rising sufficient.

The above processes vary in many places; no general rule should be laid down in this operation, as it is open to many discoveries and improvements.

At the manufacture of *Barois*, at *Paris*, for example, they manage five sets at once, which are composed of four vats each; these vats are three feet high, and four and a half in diameter; eight hides are put into each vat, and consequently each set is composed of thirty-two hides; they take them out twice a day, and re-enter them as often.

Every four days a new scouring is made in one of the four vats, that is, in the weakest; after having flung out this old scouring and washed the vat, then the third scouring becomes the

last or the weakest, and that which was the first and the strongest, becomes the second.

The eight hides which enter every eight days in each set, are plunged eight days in the fourth scouring, which is the weakest; and four days in the third scouring, which is equally weak; so on two days in the second and first: at the expiration of sixteen days they are peeled, and they are put into the four other scourings; thus each hide goes twice the round of the four vats. The same vat it enters coming from the butchers is that from which it is taken out to pass into the red scourings.

Each new scouring for eight hides, in this tannery at *Paris*, consists of ten bushels*, or one hundred and thirty pounds of ground barley, more or less: the leaven is made the day before with three out of the above ten bushels, by steeping it in hot water.

This interval of thirty-two days is sufficient to prepare the hides, either in winter or in summer; but sometimes in winter they make use of hot water to accelerate the fermentation, by adding, for example, five or six pails of hot water into one scouring.

A hide

* The septier of barley, or 12 bushels in grain, produce 195 pounds of flour, or 15 or 16 bushels of flour: the septier of grain cost 7 livres in 1763, but it is sometimes from 8 livres to 10, and sometimes more: the septier of wheat costs from 15 to 18.

A hide of one hundred weight when green, and raised by barley, takes about two hundred pounds of powdered bark, viz. fifty for the red scourings, sixty in the first barking, fifty in the second and forty in the third: in some places it is distributed in baskets of about forty-five pounds; eight hides require three baskets for the red scouring, sixteen in the first barking, and eight in each of the other two barkings.

The hides being sufficiently filled by the barley scourings, called in *France* white scourings, are put into the red.

The red scourings is made of pure water with two or three handfuls of bark between each hide.

The hides remain in this state three or four days, at the expiration of which, they give them as much more bark in the same scouring, where they continue three days longer, when they may be pitted after the same manner as hides raised by lime: these red scourings give them a necessary degree of firmness, so that the action of the tan in the pit may not be too immediate, and harden them too suddenly.

What I have said of the common method of filling hides by barley, is a sufficient explanation for expert tanners who might be ignorant of this process; but I must own it requires practice and knowledge to know when a hide is sufficiently filled, and to conduct the scourings properly. We shall still enter into a more minute detail concerning the method practised for the *Walachian* hides; as it is not so well known as the preceding.

*Of Hides prepared after the manner of Walachia,
by warm scourings.*

Hides raised by barley in only one hot vat, are sometimes called *Walachian* hides, because it is said the method has been brought from *Walachia*: these people are tributary to the *Turks*, who inhabit the side of the *Danube*, between *Bulgaria* and *Poland*: prince MAURO CORDATO made their name celebrated, and in his days arts and sciences were known amongst them: from thence it is pretended the method of making *Walachian* hides came to us, which consists in putting the hides into a very warm scouring for the space of thirty hours, after the following manner.

When the hides are softened in water, they are trampled, and the round knife passed on the flesh side, to render them supple; they are again rinsed afresh, to clear them of all filth, and then put on poles to drain.

This done, it is to be observed, either on the poles, or in the floatings, whether the hair easily detaches itself, which may happen in the summer and in warm countries, without any other preparation; if so, the hair may be taken off on the beam; if not, they must be salted, to prepare them for that operation.

The method of taking the Hair off.

The salting of a strong hide consists in scattering two or three pounds of salt of morue, alum, and saltpetre, over each half hide; the other half is turned over that which has been salted, and
they

they are laid the one over the other as equally as possible.

Being thus salted, they are piled the one over the other; the pile is covered with straw, or with a large sack; in this state they soon begin to ferment and heat; they are turned over once or twice a day, changing the fold and side, that the fermentation may be equal, and that no part may be more damaged than another.

This fermentation disposes the hair to loosen; but it must be observed not to wait till it falls off of itself, or that it be too easily plucked off; for the grain of the hide might thereby be damaged.

If any obstacle prevented the depilation or taking off the hair, on the day the hides are sufficiently heated, they should then be cast into water for a day or two, but not longer, as they would be in danger even in water.

On inspection, if some skins are sooner heated than others, they must be taken from the pile, and those which require more heating must be left.

The hair may also be taken off by the heating, without salt; they must be folded flesh ways, flap to flap, very exactly, they are then to be laid one on the other on a bed of straw litter, for that is more supple and fitted for fermentation than new straw; they are afterwards covered with a large quantity of the same straw, and thus they are left for one day.

They next day they change sides; part of the upper straw serves to make a thinner bed, upon which
D 6. they

they are again laid, beginning with the uppermost; the remainder of the covering, with the straw that served them as a bed, is made use of to cover them again; in this state they are left for one day, more or less, according as the hair is more or less adhering; and as it would be dangerous to let them heat too much, they must be inspected twice a day, to know the instant of the degree of fermentation sufficient to detach the hair, but not to exceed it.

The hair should crackle when it is pulled off, and make a slight resistance; it is even as good if it comes off by a strong twist, for the better the hide will prove, because it has not been too much softened by the heating.

If before heating these skins, there are any spots where the hair has been rubbed off, they must be bathed with a sponge or linen, soaked with salt and water, to prevent those places heating before the rest of the hair be disposed to fall.

Very warm dung would shorten one half of the time of this operation; but then the hides must be totally buried, and great attention paid to the critical moment the hair would be ready to quit.

This method is dangerous, for if any part fails through inattention, all is spoiled, and the hides become too tender, yet by taking them up early they may be shaved without danger.

Walachian Manner of preparing the Scourings.

Whilst the hides are heating, a leaven of good wheaten flour is prepared to fill them: twenty pounds

pounds of flour is to be diluted in water, and kneaded like dough for bread; with a little old dough, half a pint of vinegar may be added to quicken it; this leaven must be left in a moderate heat two, three, or four days, without being touched, covered with a cloth or woollen stuff; it will then be sufficiently soured, and fit to make the composition by which the hides are to be filled.

The twenty pounds of flour prescribed for the first leaven, are sufficient for six or seven great hides weighing fourscore pounds when green, or eight or nine young hides: the twenty pounds of flour will produce thirty pounds of leaven, a third of warm water being requisite to knead it.

It has been proved by experience, that a first leaven without vinegar would be sufficient, and that it ought to be used the next day, or the day after; for, according to the baker's observations, leaven loses its strength instead of acquiring it, when kept above twenty-four hours, particularly in cold weather. When the leaven is well soured, the composition is to be made; for that purpose a vat of five feet in diameter, and three feet in height, is made use of: one vat is sufficient for a work of six hides; but if a greater number are to be conducted, several of the like vats are to be used.

The vats must be very clean, and free from all foreign matters that might have been put in, such as lime, glue, oil, or other substances which are foreign to the acid fermentation that is to be produced.

Each

Each vat that is to be employed in the scourings, must be half filled with clean water : out of each six or seven pails of water are to be taken, which is to be put into a boiler over a fire : when this water boils, part must be taken out, with which about sixty pounds of ground barley is to be diluted in a vessel for that purpose : that quantity serves for each scouring of six large hides. The lumps are to be carefully smoothed, as they would be so much matter lost and deprived of action, and the paste is to be cleared with cold water, unto the consistence of a strong paste.

The paste thus diluted is again returned into the boiler ; and kept continually stirring with a stick, to prevent the flour settling or burning at the bottom, and it is kept on the fire until it takes three strong boils.

This paste is divided into the vats appropriated for the scourings ; it is stirred with a shovel, backwards and forwards, to facilitate the intestine motion intended to be produced ; at last the motion must be suddenly stopped with the shovel : this forwards the fermentation ; thus milk turns by being stirred two different ways.

The scourings thus composed of flour and water, a pailful or two of this composition is taken out of each, which is replaced on the fire for the leaven, and in the mean time the vats for the scourings are covered with boards closely joined.

As soon as the composition begins to simmer, even before the first boil, the pot is taken from the fire ; and this composition is used to dilute the leaven above described in a separate vessel. This
leaven

leaven thus diluted with the barley composition, is equally distributed amongst the vats; it is also sometimes heated, to augment the heat of the composition.

These vats or workings must be so warm, as to suffer the hand and arm to be kept in without pain: six pounds of salt being added to each vat, it is stirred, and covered again to let it sour for ten or fifteen days; care is taken to stir and mix it well twice each day, which done it is close covered, lest the cold air should prevent or retard the fermentation. The addition of salt appears to be very necessary, to correct the acid of the composition; for hides that have been raised or filled without salt have had their edges eaten.

The hides sweated or heated as above, having had the hair shaved off, by the round knife, stone, sand, or ashes, are brought to a running water to be well washed, both on the grain and on the flesh side; they are strung three by three at the end of a rope, and flung into the water, where they readily sink; they are there left four or five days, until they are sufficiently softened, taking them out twice each day, rinsing and draining them, and casting them immediately into the water again: by this means the mud and slime is carried off by the water, which if left on would damage them much: if they are not thus softened they pucker in the grain, which indicates a hardness that renders them difficult to tan.

Where there is no river, the hides may be softened in cisterns or vats, changing the water each day: they must be softened so, that the nail being applied on the grain it may leave its mark; when

when sufficiently soft they have a yellow cast, and often little violet spots appear ; they are then fleshed, either with the round knife, or the two-handled knife, which is most in use in *Germany*.

The fleshing is not an essential operation ; it adds nothing to its quality, but is a work of neatness. Fleshing to the quick, or discovering the vein, is to take off, by means of the round knife, all the little particles of flesh, and other useless things which adhere to the skin, so that the flesh side may appear nearly as white and even as the grain.

After fleshing to the quick, the hides must be shaved, because the depilation is not generally so well performed but that some small hairs remain, which are taken off with the two-handled knife, which is a sharper instrument than the round knife and stone that are used in shaving off the gross hair.

A bed must be formed of several skins extended on the beam, upon which the one to be shaved is placed ; by means of this bed the skin yields and extends itself, so that the grain runs no danger of being hurt : for if the skins were to be shaved on the bare wooden beam, the knife finding a resistance would divide the grain. After flinging a pail of water on the bed to wash it, the skin is passed on the grain side with the half round knife to take off the filth and extend the nerve, but the two-handled knife is the best for shaving clean.

Yet all workmen cannot use this knife ; it requires as much skill as the profession of a barber
to

to shave the hides perfectly clean. For the greater facility both of fleshing and shaving, the knives not in actual use should be kept in water.

If holidays or other obstacles should prevent the fleshing or shaving, the work might be suspended for some days, by putting the hides in cold water, particularly in spring water, being the fittest to suspend fermentation.

When the hides are shaved, they are put into clean water, then rinsed, and placed on poles to drain for twenty-four hours: but if they are to be run over again on the beam, they need not be put on the poles.

While the skins are shaving, or even before, a second leaven is prepared after the above-mentioned manner, with this difference, that only sixteen pounds of flour is made use of for six hides, instead of twenty that composed the first leaven; this second leaven, like the first, is put in a warm place, so as to excite fermentation. Sixteen pounds of flour will make about twenty-five pounds of leaven.

The sour and clear liquor of the first composition is drawn off, the dregs flung away, and the clear liquor put into the vat where the first scouring is to be made, to form a second composition, called the *complement*, and which is made like the preceding.

From each vat containing the clear and sour liquor, take six or seven pails, which put into a kettle over the fire; when this water hath given three boils, part is taken out, in which is diluted
about

about fifty pounds of ground barley, that is, about eighty pounds for each hide; the remainder of the hot liquor must be poured in little by little.

This liquor having thoroughly diluted the new barley flour, it must again be slightly boiled, and the whole be divided on the scourings.

The scourings having been well stirred with the new barley liquor, a pailful or two are taken out to be heated: when this liquor simmers, the second leaven is to be diluted in it, made as before with sixteen pounds of flour; and this second leaven thus diluted is to be poured into different vats: five or six pounds of salt are to be added to these new vats, as has been mentioned with regard to the other vats; the scourings are to be well stirred, two or three pails must be taken out to heat during the whole filling or raising of the hides.

If this process by two barleys and two leavens, to form a white scouring, should appear too troublesome, it might certainly be shortened, by using at one time thirty pounds of leaven, one hundred and twenty pounds of barley, and ten pounds of salt, for each scouring for six hides; but I have here described with a punctual exactness the process of Monsieur *Teybert*, in which he seems to have been too exact.

Those tanners that fill by barley, in the common method, use at one time in their first scourings, pretty nigh the quantity of barley we have here directed at twice; but they are sometimes obliged, when their first is not sufficient, to make a
second.

second, which greatly augments the expence; so that the process of *Walachia* is less costly, and at the same time shorter.

When the salt is put into the scourings, they must be kept a long time in motion; two or three pails are to be taken out of each, which must be kept in a boiler over a moderate fire, during the time the hides are scouring, in order to replenish the vats, and preserve the heat; and a greater quantity must be taken out to be placed in a vat of reserve, so that there may only remain in each scouring a sufficiency to cover the hides that are to be put in.

Mr. *Guimard* has proved from experiments made at *Paris* in 1748, that it was better to make the composition at once, than at twice; and indeed besides the time it takes, and the fuel it consumes, it may so happen that the complement made with fresh barley, blunts the acids of the principle, which had already begun to open itself; if that should happen, the effect will become more slow, for a new fermentation must be made, and a degree of heat increased for that purpose, which would be prejudicial to the hides.

Different methods have been tried in making the composition at one time, which have pretty nigh succeeded alike.

First, With ground barley or rye, (without leaven) and which had been prepared the eve before with boiling water.

Second, With equal parts of ground barley and leaven, diluted in water almost boiling; that
is.

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is, simmering, at the instant the hides were to be put in.

Third, With wheaten bran, half a bushel to each hide, without leaven. This bran is soaked in warm water, and suffered to ferment for one day; a pound of salt is added for each hide, at the very instant they are put in to be raised or filled.

Fourth, By using leaven of barley or rye, which is less expensive than wheat, as six or eight pounds of grain ground is sufficient for each hide. As soon as this leaven rises, it must be used, and for this purpose, it needs only to be diluted in a little lukewarm water, and to sling a little salt, as before, at the instant the hides are to go in.

Manner of conducting the Scourings.

When the waters for the scourings are prepared, the skins are taken off the poles, and plunged into the scouring for two minutes, to quicken them, and to cause them to contract the heat of the scouring by degrees. They are taken out on the cover of the vat, and left to drain three or four minutes: in which time the composition is stirred afresh: the skins are put down again, the scourings covered, and the same degree of heat kept up, by the addition of the composition kept in *reserve*: in a quarter of an hour after, the same hides are taken out the second time, and left to drain for half a quarter of an hour; in half an hour they are taken up a third time, and left to drop a quarter of an hour: in one hour more they are taken out for the fourth time, and suffered to drain somewhat longer: one
hour

hour after this they are taken out a fifth time, and allowed half an hour's draining: in short, at the end of two hours they are taken up a sixth and seventh time: the following day the hides are twice taken out; sometimes three or four times, if the hides are not of a good quality, and appear difficult to fill: at each interval the stirring is continued, that the barley flour may not intirely settle at the bottom, and the vat is closely shut after the hides have drained half an hour. It is useless to say that the degree of heat above mentioned must always be such, as to suffer the hand to remain in the vat; and this may be regulated by means of the boiler, which keeps the liquor in *reserve*; its use being not only to warm, but to repair the matter that dissipates, or that is absorbed by the hides: the hides must be always covered in the scourings.

All these frequent liftings of the hides out of the vat, followed by the drainings, cause the composition to bite and penetrate equally in all parts; without this, some parts of the hide would be burnt by the strength of the composition, and others (as in the folds) would take no nourishment.

To place the skins in the scourings requires two men, who take them by the extremities, and extend them on the fleshy side in the scourings, plunging them down with flicks, and causing the air to ascend, that they may sink the better.

The white scouring commonly produces its effect in thirty hours, or thereabouts; and by their acquired firmness in that time may now be denominated hides, being in their former state but skins.

It

It would be dangerous to let the hides remain longer in the scourings; nay in that time frequently, the strength of the composition burns the edges, so as to appear like rotten linen.

The hides being taken out of the scouring, the clearest part is preserved, to serve after as a beginning to a new working, by adding a complement a little stronger than the first. The white scourings once set a-going, cost no more to keep up than the half of the first expence.

The hides are drained on covers, till they are thoroughly cooled; they are then put into water, where having soaked an instant, they are rinsed, to take out the glutinous humour left by the barley, and are then put to drain.

Whilst the hides are rinsing, the red binder is preparing, into which they are immediately to pass. The name of red binder comes from the colour the *oak-bark* communicates to it, as they commonly call white scouring, or simply white, that which is made with flour.

Of the Dangers the Scourings are exposed to.

It often happens that the scourings turn like wine and milk mixed; the *mucilaginous* part quits the more *serous*, in which it was dissolved, and the liquor is no more *homogeneous*.

A mucous fluid is generally said to turn when it decomposes itself, so that the intimate union of the different part of the fluid ceases to take place; the spirituous parts then disengage themselves

selves from the oily; the liquor fours, and putrefaction would soon succeed. Wine, which is very spirituous, does not easily turn, because the spirituous keeps the oily parts in a state of dissolution.

Thunder showers in summer are always very sulphureous; which is the reason they turn milk; but by putting a little alkali in the milk it is prevented; adding to the sulphureous acid, a substance which easily unites with it, and prevents its action on the milk; thus it is probable that the scourings might be prevented from turning, by the addition of pot-ash, a cheap and universal remedy.

Some tanners, on the approach of a thunder storm, to prevent the turning of the white scourings, put into each vat, old iron wrapped in packing cloth, to prevent the iron from spotting the hides: perhaps the astringent force of the iron consolidates those parts too easy of dissolution, or the electric matter, attracted by the iron, quits the fluid of the scourings; or what is still more probable, the iron uniting with the acid, saturates the excess, and stops the progress of the fermentation: thus by casting filings of irons into vinegar, its acid is blunted, by forming a martial salt, which is styptick, but which has scarce any acidity; thus also from lead, sweet fugary crystals are produced from the most caustic and concentrated acid. Others think that a pound of salt, or half a pound of sal ammoniac, will prevent the scourings from turning; this must happen from the same principle; the sulphureous acid joining itself to the sal ammoniac sooner than to the parts of the scouring. There is even a probability

bability that if the scourings do not often turn, 'tis owing to the putrid matter of the hides, which forms with the acid of the scouring an ammoniacal salt, and this salt absorbs the superabounding acid, which would too much increase the fermentation.

The scourings having once failed, there is no remedy; neither will the hides be of a good quality: they cannot fill sufficiently to be well tanned; their fibres become soft and relaxed; they are spongy, and are not capable of receiving the necessary stypticity which a good tannage requires. Therefore the summer heat is prejudicial to this operation; the months of *July, August, and September*, are more to be dreaded than any others throughout the year.

When the scourings freeze, they are left quietly under the ice; in this state the hides are not forwarded, but they lose nothing of their quality; the scourings however are lost; for after the thaw they are useless, and must be cast out.

Of Hides raised or filled by Barley, as practised in England.

I have seen several tanneries in *London*; in most of these, they raise the large hides with barley, and this custom is very ancient; but the upper leathers are prepared with lime and pigeons dung, as being of less consequence.

The barley scourings are made with hot water; and are carried on a great deal quicker than the

the *French*; for the hides go through four or five scourings in six days, from the weakest to the strongest: they remain but twenty-four hours in the last, which is a new scouring that has soured for a fortnight.

To make a new scouring for six hides, they dilute five or six bushels of ground barley in warm water; they let it rest until it grows extremely sour, to hasten the fermentation and the swelling of the hides; they wait till the acid is much stronger than in *France*; the danger does not last so long, but it is perhaps more considerable, as they must be watched with great attention. An inconvenience attending the use of barley in tanning is in case of a scarcity of grain.

On this account in 1740, the raising of hides by barley was forbid; the starch-makers and brewers were also prohibited the use of it in their works: two bushels, or even two and a half, which a hide of fourscore pounds requires, would subsist a man for two months in those countries where barley is made into bread.

Of red Binders.

Barley hides and *Walachian* hides, having gone through the white scourings, are to pass into the red binder, where they begin to tan. Here follows the method of preparing red binders for the *Walachian* hides.

For every six hides put into a vat, a basket of oak-bark, containing about thirty-five, or forty pounds, cut in pieces about the bigness of the finger; this they call in *French* *gros* or *regros*, (from
E being

being cut large) and the hides are let down at the same time. This operation generally is begun in the morning; the hides are taken out at twelve, and at seven in the evening.

The first time they are taken out, they are left to drain half a quarter of an hour: the second time a quarter of an hour: at night thirty-six pounds of bark, cut after the same manner, is added, and after well stirring the binder, the hides are put in; they must be quickly laid down, that the bark may not have time to precipitate itself, which would feed the lowermost hides to the prejudice of the uppermost. The second and third day they are also taken out three times, and the hides are left to drain half an hour each time; in the morning only is added twenty-four pounds of such bark as before.

The fourth day, they are only taken out morning and evening; the draining lasts three quarters of an hour each time, and no bark is added.

The fifth day, the hides having been taken out in the morning, are drained for three quarters of an hour; after which two men stir the binder, one from the surface to the middle, the other to the bottom; and in proportion as the hides are laid down, some handfuls of bark are flung between each, and a little on the top one, whose flesh side must be uppermost, (the others are placed with the flesh side downwards:) the six hides require for this last binding forty eight pounds of the large cut bark.

The hides are thus left for eight or ten days, after which they are taken out for the last time, washed

washed in a running water, and fit to be laid in the pit.

The juice or clear red, that remains from these bindings, is as good to preserve as the clear white; it operates better than a new binder, and spares one third of large bark: but it must be made use of in the space of a fortnight from the time of its being taken from the hides: that time expired, or at most three weeks, it has scarce any strength.

The red bindings do not require to be covered as the white; but they are kept always full, to two inches of the edge.

The red bindings strengthen the hides, and by degrees dispose them to feed on the nutritive parts of the bark in the pit. Without this operation, the hide would too suddenly receive the strong nourishment in the pit, would lose its filling, grow horny, draw on the grain, and at length resist the astringent parts of the tan.

Advantage of the Walachian method.

The *Walathian* method which I have now described is less liable to inconveniencies from thunder, or other accidents than the common scourings; first because those of the new method do not last good so long; secondly, because the fermentation is stronger, and the composition more worked by fire: the same preference must be given to the red bindings; they are stronger, conducted by degrees, and made with the bark in substance, whereas the ordinary red of the tanners is made with the powder tan.

If, nevertheless, it so happened, that the scouring had turned, then the hide takes air, swims

on the surface, and makes a whistling when pressed. Such a scouring cannot be mended; it must be flung out, to make room for a fresh one, in which the hides are placed, after they are well drained; but a hide that meets with this treatment never tans well.

Manner of polishing, on taking off the hair of the Wallachian hides.

By repeated experiments made at *Paris* in 1748 on the *Walachian* method, it was found, that the trouble and danger of heating before described, might be omitted, by putting the skins with the hair into the common composition, which causes the hair to fall off without danger, and with so much facility, that one man would polish six times more than those heated with salt, after the manner above mentioned.

It was also found, that after the depilation or polishing, if the skins were left long in soak, they run a risk of being pricked by the liquor, that is, of having small holes in them, which enlarge in the working.

Experience convinced us also, that when the hides are ready to receive the swell, it is useless to drain them, and that each time the hides are taken out of the scourings, it is proper to bricken them in the river; but they must first be cold, or they would be liable to incline to the grain, that is to be wrinkled and hardened, if they were suddenly plunged into cold water, when their pores were opened by heat.

Hot

Hot Scourings with Bran.

In 1749 a memorial was presented to the *Intendant of Commerce*, containing a method of making white scourings with bran alone, and totally suppressing the red binders; as we cannot dwell too long on so interesting an object, we shall give the process, that those who have courage enough to make further trials, may learn from what has been already practised.

Two or three days before the hides are sufficiently soaked, a leaven is made with wheat or rye flour, unless lees of beer can be procured. A pound or five quarters of flour is sufficient for each hide; this leaven is to be kept in a moderate heat, till used.

The night before the hides are to be filled, the dirt and filth that sticks to the hair is to be taken off; they are to be fleshed, and put into water: the same evening a sufficient quantity of water must be heated to bathe them intirely: when it is luke-warm, it is taken from the fire, and seven or eight pounds of wheaten or rye bran is put in for each hide; they are to be well stirred together, and the pot covered to concentrate the heat, it is left in this state to ferment, till the bran rises on the water, which generally happens the same night; from whence it may be judged that the fermentation is sufficient; the hides are then to be well rinsed, and immediately without draining, to be put into a vat to supple with the bran and water, which was in a state of fermentation in the vessel.

Whilst the hides are taking their first degree of heat in this scouring, fresh water must be put

into the pot, to replace that which the hides may have soaked in their filling, and this is to be heated till it simmers. When it approaches this degree of heat, the hides are raised in the scouring, and the warm water is taken out little by little to dilute the leaven before mentioned, in a separate vessel.

The leaven being clearly diluted, is flung into the scouring out of which the hides have been lifted; what remains in the pot is also flung in, to render the scouring a little more than lukewarm; about a pound of salt of *morue* to each hide is cast in, and the whole composition is well stirred, the hides replunged, and the scouring covered.

As the first scouring does not require to be so full of compositions, and it is sufficient if the hides are covered, a certain quantity is taken out, which is returned into the boiler, for the advantage of heating the hides, when they are taken up six hours after.

If the work has been begun at six in the morning, at twelve they must be taken up, the scouring heated, the composition well stirred, the hides replunged, and the scouring covered.

The same operation is to be renewed again the same day, at about seven in the evening; the next day, and the following day, at the same hours, that is, lifting up, reheating, stirring, and covering the scouring.

Attention is to be paid in taking up the hides on the second and third day, if the hair is ready to quit; after they have been shaved, they are to be slightly fleshed, to take off the superfluous parts,

parts, then left to soak a quarter of an hour in cold water, and again put into the scouring, which is reheated several times and covered close, till the filling is perfected.

It is easy to fill the hides in twenty-four hours, if the composition be reheated seven or eight times, but the hides will be better if this operation be made in three days, and the scouring gradually heated three times a day, proceeding from a gentle heat to a stronger, and after such a manner that the naked arm may rest in it without pain at the highest degree of heat.

If this method be carried on where there are large quantities of hides in the scourings, they will preserve their heat longer, and it will be sufficient to reheat the scouring twice a day; the operation may be prolonged to four days, and it will be possible to save a pound of bran on each hide, that is, to use but six pounds for each instead of seven.

There is also an œconomy in making several sets to succeed, as soon as the first filling is finished, by throwing other hides into the same vat, without giving it time to cool, and it will be sufficient to ferment these new hides until the hair falls off.

These second hides, thus peeled in a feeble scouring, might be finished in two or three reheatings in a new scouring, and this new scouring will perhaps be sufficient to the entire filling of a third set of hides; thus three sets may be swelled and raised by two compositions: experience must direct the tanner in this.

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The hides being filled, must be rinsed, and steeped in clear water for three hours, more or less, according to the heat or cold; they then go through the red binders, either with old liquor of bark, or with a liquor of clear water, with fresh bark of the size of the finger, which is added successively, and by degrees. The best tanners in France take them out three times in the space of three or four hours, leave them to drain a quarter of an hour, and then lay them down after the binder is well stirred.

Cold Scourings with Bran.

Tho' I have fully laid down a method of making scourings with bran, by which the vat is to be several times heated, yet this may also be done cold; but then the filling is protracted, and may last two months; for heat greatly accelerates fermentation, altho' some think it a prejudice to the hides; perhaps this fear may be ill founded. After making a leaven with two pounds of flour of barley, or rye, for each hide, it is left to ferment, and then diluted with clear cold water; the hides are put in with the hair. They are taken out two or three times a week, leaving them to drain the whole night on the scouring; they are thus continued till the hair seems inclined to quit.

The hides being shaved, rinsed, and lightly fleshed, they are put to refresh two or three hours in the water, after which they are put down into the same scouring to complete their filling. If the first scouring is not thought sufficient, a second must be given, to finish the filling; but
when

when a first dead scouring has been used to peel the hides, one new scouring alone will be sufficient to raise them perfectly; they being already prepared by the dead scouring which served to take the hair off. The scourings with cold bran stand in no need of being covered, as we prescribed for the hot; this method may be of use to poor country tanners, who have neither boilers or furnaces.

Thus M. Guimard, an able tanner, thinks that eight pounds of bran are sufficient to a hide; while those who fill by barley are obliged to make use of a hundred weight; and those who follow the *Walachian* manner require thirty-six pounds of flour: and by this method, salting and heating of hides would be avoided, and fuel saved.

Hides filled or raised by Rye, after the method of Transilvania.

Transilvania is a province bordering on *Turkey*, a little distant from *Walachia*, where hides are worked much in the same manner we have already described. The chief difference consists in using for each hide eighteen pounds of ground rye, instead of twenty pounds of barley, necessary for the *Walachian* method: of these eighteen pounds of rye, ten are put into the first composition, and eight into the complement or second.

The dregs of rye preserving their strength and quality longer than barley, they are not cast aside as those of the latter, but the rye is kept, even after drawing off the sour liquor of the first composition, for the purpose of the scouring.

Several shoemakers have thought, that leather made by rye, called leather of *Transilvania*, was preferable to that of *Walachia*; perhaps, in fact, barley being more farinaceous or floury, ferments in another manner, and furnishes less firm and solid parts to the hide, for the same reason that the hides of *Liege* are preferred in certain cases, which are fermented with liquor of bark or ouze; because its fermentation is harder, or less unctuous, less laxative than that of ground rye or barley.

In the memoirs of M. *Desbillettes* presented in 1708, I find that the use of rye was then known in *France*: he says the skins being shaved are put into the river, for twenty-four hours; after that, into a weak tan liquor, for two hours, putting them out and in very often; from thence they are put into another matter, of which the following is the preparation. Take a *septier* of ground barley, (the *septier* of *Paris* is twelve bushels; the bushel 66 $\frac{1}{2}$ cubic inches) and pour on it warm water, stirring the whole well till it becomes a thick paste, as if to make bread: this paste is left covered to work and ferment like leaven; when the surface appears white (and as if musty) as much cold water as may soak ten or twelve skins is to be poured on it, then these skins are to be laid in it for three days; and when they are well filled, they are plunged into a tanning liquor, with a quantity of bark between each; the water must be changed two or three times in the space of eight months, which is about the time they require to be well tanned.

Of Hides raised by Oak-Liquor or Ouze.

The effects produced by lime-water, or sour water of barley and rye, might be produced by

several other means, and several have been tried in different places : that which seems to be the most in use, and the cheapest, is the sour liquor of bark: Hides are said to be raised by bark, when prepared by this method : the *French* tanners are indebted to those of *Liege* for this discovery (therefore they are called *Hides of Liege*) ; this manner is actually followed in several parts of the kingdom, and perfectly succeeds ; and to this method the manufacture of *St. Germain* owes its great success, and the great esteem it is now in.

It is called in French *Cuir a la juset*, from the French word *jus*, juice, and often, by corruption, *gisee*, or *gisey*, in English, *ouze*.

Method of taking off the Hair.

To depilate or make the hair fall off from hides to be filled by bark, they must be fermented by a moderate heat ; this is practised by various methods, according to the different places, where they are worked.

The hides are piled on the ground one over the other, either in length, or doubled, until a gentle fermentation loosens the hair, and softens the upper skin.

Some accelerate this putrefaction, by putting the hides on poles, in a close stove, heated by a tan fire, which only produces smoke and heat, without flame or danger.

Others place their hides in very hot dung ; this produces the effect of a stove, and raises the ne-

cessary heat for fermentation. This method may perhaps appear too expensive and troublesome; yet it is certain that this dung might again serve for its first destination, *viz.* agriculture, as it would lose but little of its quality by this operation.

It has been already observed of hides filled by barley, that the hair might be made to fall off by a weak, or dead scouring. I believe the same might be practised on hides raised by bark; by making use of the tan scourings when almost spent, of which I shall give the description hereafter.

Hides with the hair on, which come from *America*, *Buenos Ayres*, or the *Islands*, and which are dried by the heat of the sun, are more difficult to be deprived of the hair; and a considerable loss of substance ensued, when the fermentation was sufficiently raised to make the hair fall off easy.

To obviate these inconveniencies, the undertakers of the royal tannery at *LeSoure*, tried to shave the dried hides from the *Islands*, instead of taking the hair off by the heat.

This method is equally advantageous, both as to salt, and fresh hides; there is a profit on all sides; the danger of fermentation is avoided, the degree of which it is difficult to hit on; the salt is saved, the trouble of heating, and the workmanship abridged; for one man can shave ten or twelve hides a day; whereas by the common method he would not polish more than five or six.

Of the swelling of hides by oak liquor, or ouze.

The hides being polished they are put into vats, to fill and fit them for tanning. At *Namur* and *Liege*, the filling of hides is done by the means of liquors of old bark, or juice of tan, which contains the residue of the substance of the bark, after it has served to tan hides in the second or third barkings: this filling needs no fire; it is even said that heat is prejudicial to it.

This juice of tan, called also ouze, must contain no *styptic*, that is, of that rough and astringent taste, which contracts and hardens the hides in pit, and which is very sensibly perceived in new bark. When the bark has remained with the hides in pit, it is disposed to ferment and sour, as all plants and animal substances do in general; the styptic quality then ceases, and acidity takes place, which would still go on augmenting, if the hides were not taken out at the expiration of some months.

The bark, while in its natural astringent state, tightens, compresses, and reunites the parts of the hides; but as soon as it turns sour, it produces a contrary effect; it dilates, relaxes, swells, and raises the cellular parts, by the intestine motion it produces, like unto bread that raises, and wine that bubbles up, when exposed to the like fermentation.

All seasons of the year, nor all waters, are not proper for raising hides by bark liquor; it succeeds badly in summer; it requires pure spring

water; that coming immediately from the rock is the fittest; rain water is not good.

In short, those who esteem the hides of *Liege* as the best leather, agree that it is the most difficult to work; it requires a great skill, intelligence, and capacity; but in this, as in other trades, practice surmounts all obstacles.

To prepare the juice of tan, the old bark is collected in which the hides lay in the second or third barking; (the third is preferable;) the liquid which it contains is also taken up; the whole is deposited in an empty pit or other large vessel.

The pit into which this old bark is laid, must contain a waste well or cess-pool made with boards, nailed together, and adjoining the side of the pit: this cess-pool is to contain the water which separates from the tan in the pit; and its situation is convenient to empty it with a pail, for the use of the hides hereafter explained.

This bark is trampled and drenched with clear water or tan liquor, till it be abundantly overflowed: the liquor gathered in the waste well or cess-pool is taken out two or three times a week, and poured over the tan in the pit, that by repeated filtrations, the juice may become stronger and stronger, and feed itself with the whole substance of the tan.

Without being at the trouble of making a waste well in the pit, a kind of well might be hollowed in the tan, out of which the clear liquor might be taken, and filtered through a basket to have

have it more pure; but the waste well is yet more convenient.

About *Sedan*, to make the juice of tan or ouze, they make use of vats that contain about fifteen hogshheads of water besides the bark; (each hogshhead measure of *Burgundy* contains only 11520 cubic inches, that of *Paris* 14400; so that the muid or hogshhead of *Burgundy* is four fifths of that of *Paris*) they use the tan grossly ground, and taken from the pit of the second or third barking: the water remains with the bark for six, sometimes for eight months, and it takes that time to acquire the acidity or sharpness requisite to fill or raise the hides.

When this water attains the degree of acidity without being stirred, some of the bark is taken out towards the side of the vat, to form a kind of well or hollow about a foot in diameter; this must go to the bottom of the vat, that a pump may be put in, to take off the liquor that hath settled at the bottom, or the waste well must be made use of; this liquor is returned on the bark, until it be quick and good: if at the expiration of two hours it be found sufficient, this work is left off, and all the liquor is taken out to make the scouring. The liquor is said to be quick when it is red, clear, and acid, like fine vinegar: when there are two vats of tan liquor, and that the one is more strong and acid than the other, they are to be mixt together, and thereby brought to the same degree.

When the liquor has been taken out of the vats, the tan is not useless; more water is put on, which remains three or four days, and which
after

after that time is endowed with sufficient qualities to compose the scourings: this operation is repeated three or four times, observing by degrees to let the water remain longer on the bark, to make it yield all its strength, quality, and acidity: these different liquors are mixed with the first, that had remained six or eight months on the tan. The more vats that are made use of, the more facility there is in making these operations and mixtures.

While the ouze which is to fill the hides is preparing, those that are dry are to be soaked; the round knife is passed on the flesh side, after the same manner as if they were prepared for liming; but it must be observed, the last time they are taken out of water, they are to be left to drain on the poles, that they may contain no water when they are to be heated.

If they are green hides, this method does not require their being soaked; but while they are yet fresh, a few grains of salt are flung on the flesh side, that they may heat more equal, and with less danger; they are then folded, in order to sweat or heat; fermentation makes them tender, and disposes the hair to quit. The *Irish* hides have no need to be so much salted in the heating, as they are salted before they come to *France*.

Being polished, rinsed, and fleshed, after the same manner as those to be prepared by lime, they are to be soaked in very cold and clear water, for two days in summer, and four or five in winter; observing each day to drain them for three hours, and to change the water; sometimes in this state the hides are perceived to open, and dispose

dispose themselves to swell; such are then put into the scouring, that is, in ouze, to favour and augment this filling: towards *Sedan* they make eight scourings in summer, twelve in winter, and they augment their force by degrees. I shall hereafter shew the method followed at the great tannery of *St. Germain*.

If the work is carried on in summer, the hides are put into river water, mixed with an eighth part of tan liquor, taken out of the waste-well aforementioned.

The second scouring must be of two eighths of tan liquor upon six eighths of river or spring water; the third of three eighths of liquor upon five eighths of water; the fourth of four eighths of liquor on four eighths of water, that is, equal parts; the fifth of five eighths of liquor on three eighths of water; the sixth of six eighths of liquor, on two eighths of water, that is one quarter; the seventh of seven eighths of liquor on one eighth water; the eighth or last, of pure liquor.

The vernal and autumnal scourings being ten in number, are made of putting only a tenth of liquor upon nine tenths of water for the first scouring; two tenths of liquor in the next, and so on augmenting the juice, and diminishing the water unto the tenth scouring, which is made of pure tan juice.

In winter the scourings being twelve, are made by putting only one twelfth of juice upon eleven twelfths of water for the first scouring: for the next two twelfths of liquor and ten twelfths of water; the third is composed of three twelfths of liquor,

liquor, that is, one fourth, with three fourths of water, and so on to the twelfth and last scouring, which must be of pure liquor.

The method of making these scourings consists in taking up the hides morning and evening, draining them for two hours, after which they are put down again into the scourings, and each day the scouring is changed, until the fourth scouring in summer, and the sixth in winter; that is, during the first half of the scourings which are to be given,

From this fourth scouring in summer and sixth in winter, the hides are taken out but once a day to drain, until the last scouring but one; that is, to the seventh in summer, or to the eleventh in winter; they are then only taken out at the end of a day and a half; and after draining for two or three hours, they are put down again; a handful of bark grossly ground is scattered on each hide.

The hides remain in the last scouring three or four days, and being taken out and left to drain for three or four hours, are put into an extraordinary scouring, composed of the purest and strongest liquor, with three handfuls of new bark over each hide; they remain in this new scouring six or eight days; at the end of which they are fit to be put into pit, like those raised by lime.

When a fresh parcel are to be scoured, the vat which before was the first is emptied and is of no further use, that which was the second, becomes the first or weakest, and that which was emptied, becomes the new or extra scouring, made with the
best

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best tan liquor, and is the tenth and strongest of all the vats: thus each vat before it is emptied, has served for the preparation of seventy-two hides.

Although I have said that hides are filled in the space of twelve days, this will seldom happen but in the temperate months of *May, June, and July*, as may be conceived by what has been said on the subject of fermentation in general. Sometimes double that time is required: in that case the hides must be left forty-eight hours in each scouring. In cold weather the liquors do not spend so quick; fermentation is slower; the acidity is not so readily communicated in extreme hot weather; the liquors weaken themselves, the hides fill with difficulty, and sometimes require to be left two days in each vat.

All tanners should have spare vats, because sometimes they do not produce the desired effect; they sour too slow or too quick, and some turn as has been explained in that part treating of barley vats; and the method to prevent it; the heat of the sun alone is sufficient to turn these scourings, as I shall shew hereafter.

We have supposed, that to begin a scouring, bark is used which has already served in the tan pit, but if this was not to be had proceeding from the establishment of a new tannery, or from any other cause, there are several means to supply its defect.

It may be begun by scourings of barley, by the method already explained: and the ensuing year will produce a sufficiency of old bark for the scourings:

scourings: unless such bark has been used in tanning hides raised by lime which is never good: but, as to make these scourings, it is only requisite to pour the water of the bark (that is, to take off its natural bitterness and astringent force) to put it into a state of fermentation, the following method may also be used, without the use of grain.

Fill a vat with bark grossly ground, and pour on water which much remain seven or eight days; this water being racked off, fresh is added, which must be taken out at the end of the next eight days, and thus continue until the water has taken off all the sharpness and bitterness of the fresh bark. Then this bark is in the same state as if it had spent all its force in the tan pit with hides: fill the vat with fresh water, and leave it for the space of eight or ten months, in which time it will have fermented sufficiently for the use of filling hides by bark liquor.

The same variety of methods which have been seen in the barley scourings, may also be diversified in those filled by bark liquor. In some countries they fill or swell with five scourings and use but three vats. The first scouring is called *dead*, because it is without strength, being only composed of pure water, and four baskets of old spent tan.

This *dead* scouring is only made at the instant it is to be used, that is, when the skins are sufficiently trampled and softened; and being strongly rinsed from tail to head, and from head to tail; they are put into the dead pit, and taken out three times each day, *viz.* at morning, at noon, and

and at night ; leaving then to drain half a quarter of an hour each time.

The next day, the *dead* is flung away, and the hides are put down three times, into the weak scouring as before ; this *weak* has been prepared four or five days before, with three quarters water, and one quarter of liquor, on six baskets of tan : they are permitted to drain a quarter of an hour, and the weak, (having scarcely any virtue) is cast out, like the *dead*, after having served the day.

At the third draining of the hides from the *weak*, they are scoured in the *strong*, and likewise taken up three times a day, draining them for half a quarter of an hour each time, and so for three days.

The *strong* is a third scouring mixed up two or three days before, with equal parts of water and juice, and six baskets full of the tan aforementioned.

At the expiration of two days, the *strong* being exhausted, the hides must be transported into a stronger liquor ; this is the fourth scouring, composed of the clear of the *strong*, or preceding liquor, and of the sour of the waste-well or cels pool, that is, the juice which has been several times filtered on the tan.

The hides are laid down in this stronger liquor for five days, leaving them to drain half an hour each time, and stirring the scouring. The first day, they are put down in the morning, adding a basket or thirty-six pounds of bark cut about the bigness of the finger for every six hides ;
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omitting the bark at noon and night. The second and third day, they are laid down three times again, and at morning only twenty pounds of large cut bark is added as before. The fourth day, they are only laid down twice, and in the morning they add twenty pounds of bark. The fifth day, after having taken up the hides, and left them to drain half an hour, and stirring the scouring, sling in some handfuls of bark between the hides, and on the uppermost, unto the amount of forty pounds of gross bark; the hides are then left to rest in this strong liquor eight or nine days, after which they got into the fifth and last scouring, called the *strongest*, because it is composed of *all sour*, that is, of that pure juice taken out of the pit, by means of the waste-well.

This last scouring is only made when wanted; during the three first days add twenty-one pounds of gross cut bark in the morning, when the hides are laid down; at night they are again laid down without any additional bark.

The hides being left three days in this *strongest* liquor, on the fourth day they are taken out again and laid down, being first left to drain for three quarters of an hour; two workmen then stir the scouring, one from the surface to the middle, and the other from the middle to the bottom, and while they are laying down, a third flings about forty-eight pounds of gross tan between the hides. They are then left in this liquor for eight days, and this is their last scouring.

Some tanners, fearing the fermentation of hides thus prepared by bark liquor, may be interrupted or troubled by the addition of crude water in the first

first scourings, have recourse to another expedient: they wet the tan only with as much water as will soak it, so that the water may not swim on the surface: at the end of four days, they take out all the sour, or juice, of the waste well, and reserve it for this strongest or fifth and last scouring. They then water the tan again for three days, and this yields them a second juice, which serves for the fourth scouring, which we have called the *stronger*. In following this operation for several days, they have at each a new filtration, a fresh juice more weakened, and which serves for the inferior scourings, which I have called the *dead*, the *weak*, and the *strong*.

But these precautions are only necessary to set the scourings a-going, when a new operation is to be begun; when hides have been once scoured, each scouring is found to have lost near a fifth of its strength, and serves to form the scouring that precedes it for other hides; thus the scouring which has served for the *weak*, will be afterwards employed as the *dead*; the *strong* will become a *weak* scouring, and so on; so that at each operation they will only want the strongest liquor, which is composed of the most sour or most pure juice drawn from the pit by the *waste well*.

It is necessary to observe, that when hides are put down into the scourings, the flesh side must always be uppermost, that the grain, which is the most delicate and valuable part of the hide, may be guarded from accidents; for this reason the last hide must be turned flesh side uppermost, to serve as a covering to the rest.

Remarks

*Remarks on the Scouring of Hides by bark liquor,
called Hides of Liege.*

It is necessary that the scourings should be covered and clayed over, like the pits, that they may not be exposed to the vicissitudes of the air; this is the method practised at the manufacture of *St. Germain*.

When the hides have been some days in the scouring they examine them, and such as are fit are touched on the flesh side, and shaved on the grain side with a very sharp knife, to take off such hair as may remain, they then are put into water to refresh, and from thence into the other scourings, to receive the proper degree of filling.

The grain shews if a hide thus prepared be well scoured, and if proper to be pitted, for then the grain is whitish or ash coloured: whilst it retains a yellow cast, it is a sure sign that the hide still wants scouring.

The same degree of strength in the scourings is not sufficient to fill all kinds of hides; that of an ox of four years old, is more tender than that of a more aged ox, hardened by age and by work; Tanners who put into one and the same scouring indiscriminately all hides that come to hand are bad artists, and are liable to make bad leather, for if they are not equally filled in the scourings, the tan or bark cannot recover the fault, for the hides may remain for ever in the tan pit without effect, if they have not been sufficiently raised or filled in the scourings, that is, if not prepared to receive the tan: if they are not thus prepared, a
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hard and compact surface will oppose itself to the action of the bark; instead of an open and soft substance, which only can be rendered good leather by the action of the bark.

If a method could be found of swelling the large hides of old oxen, as readily as those of young, we might be sure, that by leaving these old hides longer in pit than the others, they would in proportion acquire a superior quality; but it is one of the great inconveniencies of the tanning trade, that the strongest hides fill or swell with the greatest difficulty. I shall now make some remarks on the nature and quality of hides prepared by oak liquor.

Another method of working the Scourings for hides prepared by oak liquor.

I shall avoid repetition in this chapter as much as possible; the method practised at St. Germain is simple enough, and being justified by long experience, it must be of use to relate it in this place; the tanner who would profit by my labour, in making these experiments, will be a judge of the difference and effects of these various methods. At St. Germain, twelve scourings are commonly used, the two last of which are new scourings; the first ten are those which have already served: each of these scourings contain twelve hides, and eight measures or muids of water; each muid measuring four feet and a half in depth, and as much in diameter.

The hides being shaved and washed, are put into the first scouring, which is the weakest of the whole; the taste of this liquid is scarcely acid,

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when put on the tongue; it is somewhat rough, yet sufficient to prepare the hides to pass into a more sour scouring; for hides must not be too suddenly attacked by the acid, before the fermentation has established itself, or they would crisp and contract themselves too much.

At the end of twenty-four hours, these twelve hides are taken up, and left to drain half an hour, or during the necessary time to raise the other scourings; for the exact time they should be left to drain has never been ascertained; they are put down into a second scouring, somewhat stronger, and the water of the preceding is hung away, which having served ten times, is of no more use.

The second scouring, tho' a little stronger than the first, has not any sensible acidity on the palate; but the next appear stronger and stronger, and the twelve hides are taken up each morning, and put down in the succeeding scouring.

The ten scourings which the hides thus go through in ten days, are called *running scourings*, to distinguish them from the *settled scourings*, which I shall now describe; they are new scourings, in which the hides remain during ten days; but before I treat of these new scourings, I must speak of the four pits employed to make them.

At St. Germain they have five four pits, like unto those in which the hides are tanned, and are well sheltered in the tannery; I shall distinguish them by the numbers 1, 2, 3, 4, and 5, by calling 1 the weakest, and 5 the best and strongest: they take up the hides raised by bark liquor from the third barking, and transport all the ran which

has been taken out into the fifth four pit, fresh spring water is conveyed into it by means of a cock and wooden gutter, which reaches from the cock to the pit: this water filtrates itself on the tan, and falls by degrees into the waste well, which is at one corner of the pit, from whence it is taken out at the end of three days or more: this affords sufficient to make four settled scourgings.

When the tan of this four pit has spent its strength in the first water, fresh water is let in, which passing on the tan scours itself, and forms a first four pit, which I shall call *first* and *second*; these are the last or least of the five: the middling pits, which I shall call *third* and *fourth*, are formed by this second water of the pits *one* and *two*, which is poured on a tan which has already furnished a first water for four scourgings, as I have already said; instead of letting in spring water, they put in the liquor of the pits *one* and *two*, which by repassing again once or twice on this four pit, tho' already spent, yet strengthens itself, and serves to make the two middling pits, viz. numbers 3 and 4; thus numbers 1 and 2 are composed of spring water poured on tan, which has already furnished its new scourgings; numbers 3 and 4 are formed by this same water, poured over one or two others of the like kind, to take the remaining strength out of the tan; lastly, number 5 is the first water of this tan, that is, the most four, and best to make new scourgings.

The pits 3 and 4 serve to make the first settled scourgings, the pits 1 and 2 serve to sprinkle the others; the 5th serves to make the best scourging; thus

Thus eight scourings must have been taken out of a four pit, before it is spent and useless.

To make a first new scouring, or *settled scouring* of rest, they not only take some muids of four water, but for every twelve hides they add six baskets, of about forty pounds each, of gross bark, that is, twenty pounds for each hide. To procure this gross bark, the tan is passed through a riddle, to take out the powder of the bark; and there only remains that which is in little sticks, one, two, three, and even four inches in length; this bark, which is put into the settled scouring, adds sufficient strength to it to preserve it for ten days in a proper state of acidity to fill the hides. In some places where the hides are put into a fourth barking for six weeks, this fourth barking having more strength, is sufficient to make the new scourings, without addition of fresh bark.

They equally put six baskets full of gross bark into the second settled scouring, though it be a little stronger than the first, because it has been made with water of the *fifth* four pit; the hides also remain there about ten days, as in the first, after which they are fitted for laying in pit; they are laid down with all their moisture which they have contracted in the *settled* scourings. Some think it important to put them in immediately, that they may not be checked of the swelling and thickness they have acquired by the fermentation of these different scourings; sometimes also they sprinkle the pit with the water of the four pits or scourings; that the hides may preserve as long as possible that state of dilation or swelling.

In winter, when fermentation is slow, they are obliged to scour the hides in a greater number of *running scourings*, sometimes twenty are necessary before they are fit to be put into the *settled scourings*, for if the hides were put in too *white*, the acidity of these *settled scourings* would seize them too suddenly, and would pucker and crisp, instead of swelling, dilating, and distending them.

Sometimes, even after the *running scourings*, they are obliged to give them a scouring, which is of a medium strength between these and the *settled scourings*, and which is composed of half four water, half common water, and three baskets only of gross bark. On the contrary, when the hides have been heated before their arrival at the tannery, they are brought on quicker; and they give them but four or five *running scourings*.

Heat is prejudicial to *running scourings*; therefore the tannery is kept closely shut in summer during the day, to keep out the heat, and opened after sunset, that the cool night air may come in; to encrease this, the water of some adjacent brook is conveyed through it, as much greater precaution is required for hides raised by bark, than for barley hides.

When the hides do not come on, that is, do not thicken quick enough, they are hastened by more frequent and stronger scourings, or else they are left longer in each; sometimes two days instead of one.

If the place, where these scourings are made, is too hot, they will putrify and turn, or be-

come rosy; the hides will soften, and grow thinner, instead of acquiring thickness and quality.

When the hides are taken out of the first scouring, which is a *dead* scouring, the liquor is flung out, preserving the old bark for fuel; they wash the scouring, and put in a *sour* water to form the new scouring.

A *dead* scouring which is spent, and where all fermentation is extinguished, will yield a clear water, if it was of a good quality; by this sign it is known if the hide is improved; fermentation is extinguished in this fluid, because the *alkaline*-animal substances have saturated the acid of the scouring; for this reason the liquid will not appear muddy, as fermented matters generally do.

Remarks on Hides filled by oak-bark liquor.

Hides filled by oak-bark liquor; consume a little more bark than barley hides; first, on account of the *settled* scourings, where forty pounds of bark is allowed for each hide; secondly, because hides filled by bark liquor, remain longer in the pit than barley or lime hides; at the manufacture of *St. Germain* they estimate, that each hide consumes between two hundred and twenty, and two hundred and fifty pounds of bark, when filled by oak liquor: that each barley hide requires two hundred and twenty-five, and those filled by bark two hundred and fifty each.

The hides filled by bark are sold at *St. Germain* from twenty to twenty-five *sols* a pound. But we shall treat more at large on the price and commerce

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of hides, of the expences of their preparation, and the profits of the tanners.

A hide filled by bark liquor requires particularly to be well beaten, even with hammers of cast and wrought iron, and with frequent strokes: experience proves there is an astonishing difference between the lasting and goodness of soals of the same hide beaten, and those which by the negligence of the Shoemaker have not been sufficiently beaten. At *Bâle*, in *Switzerland*, they make leather of lighter and thinner hides than ours, yet they are good because beaten with great force with copper hammers. As the shoe-makers in general will not give themselves this trouble, it were to be wished that the tanners and leather-dressers would beat their leather.

The hides from the *Brazils*, dried with the hair on, sometimes succeed badly when filled by oak liquor; they are too hard; with great difficulty can be softened and swelled, and are too much scored with the knife on the flesh side, proceeding from the careless manner of flaying them in *America*, where nothing is sought for but profit and rest, without considering the quality or the goodness of the commodity. In a country, where they cut down a tree to gather the fruit, and kill oxen only for the hides, such a neglect will seem the less surprising.

The *Irish* hides are also too much scored by the knife, certainly because they are not skinned with proper care.

The most preferable hides to be filled by oak-bark liquor, are those of the *Limoges*, where the

oxen are fed on radishes, and not fattened till well worked; they have not much fallow, but their hides have more firmness than those of other countries, where oxen are only reared to fatten. I shall hereafter shew the great advantage of this method of raising hides by oak liquor.

Of filling Hides by Yeast.

Seeing that barley, rye, bran, &c. by producing four liquors, proper for fermentation, caused the hides to swell pretty equally, it was natural to think that all other four liquors would produce the same effect; this method perfectly succeeded by experiments made in 1749; it is probable that the spirituous parts contained in the lees of beer, are of proper quality; for this reason bakers often prefer it to raise their bread. We are indebted to *M. de Monteran, intendant of commerce*, for this idea, which must save expence and trouble, as the grounds of beer are a useless matter for any other purpose, and yet capable to produce a very good fermentation.

Grounds of beer taken hot, coming out of the boiler, are put to ferment in a close scouring, that is, in a vat of pure water; when it is at the highest pitch of fermentation, salt is scattered on it, and the hides are laid in, after being soaked, cleansed, and fleshed; this scouring is re-heated, and the hides are taken out at several different times, until they be sufficiently filled: and the whole operation of the beer scourings is the same as those of barley or bran.

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These beer scourings may be equally made cold as I have already mentioned concerning the cold scourings of bran.

The preceding method compared, and the advantage of raising Hides by oak liquor explained.

Although no very precise experiments have been made on this subject, experience seems to decide in favour of the oak liquor hides, and next of barley hides; yet the liming of hides is very ancient, and many selfish tanners are so much attached to it, they think it still preferable, for by the report of the inspectors, made to the board of commerce in 1746, the tanners of *Montreuil* and *Pontiff* attested, that though they made use of barley, yet they thought lime preferable: those of *Poitou* and *Franche Comté*, said that barley rendered the hides spongy and brittle, and that it dried up the nerves. These objections must be the effects of prejudice; for in all other parts barley hides are better esteemed than hides raised by lime.

Some have insisted that a distinction ought to be made in the manufacturing and sale of hides; to sell for winter wear limed hides only, that had been very long tanned, and for the summer season barley hides lightly tanned; by this means, they say, the complaints of customers made to the shoemaker and from the shoemaker to the tanner would be avoided; being sometimes by them reproached, that in the month of *August* their shoes have been burnt by a short walking; at other times that two hours walking in the wet have soaked them for the whole winter; perhaps this difference holds good between barley hides

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and those raised by bark; but as to limes I think it ought in general to be prohibited.

Hides that are too thin, and which have little substance, and those of oxen spoiled by hard working, or dried up by old age, do not succeed so well when filled by bark, as by barley scourings, after the manner of *Transylvania* or *Wallachia*; each may be used, because the soft and unctuous fermentation of the barley or rye paste penetrates, nourishes, and makes some skins appear to advantage, which would have been rejected at *Lisge*.

Those who have learnt to tan after the *Lisge* method, by oak liquor fillings, attest that it is as much beyond the barleyed hide, as this last is superior to the limed hide; and that the public would reap a much greater advantage from hides filled by bark liquor than from any other, because in its preparation there neither enters lime or any other ingredient to alter its quality; the general reputation these hides have throughout *Europe* seems to prove the same. By a report from the tanners of *Brittany* 1756, it appears they were all convinced that the filling of hides by bark was preferable to that by lime; but none dared to undertake it before the tanners of *Paris* and of the neighbouring provinces had set the example.

Leather filled by bark is said to be very good for pumps in dry weather and dry countries; but many say that it is not so good to wear in the wet as the barley leather; this arises from the preference which each gives to his own method of working; leather made by oak liquor is but little used in *France* as yet; for that reason alone, it may find detractors. But, if we call reason to

our assistance, we may very easily conceive that leather prepared with an astringent matter, must be better than leather prepared with farinaceous, unctuous, and emollient substances, such as barley and rye; thus I think, that according to the physical part of this process, hides raised by oak liquor must be the best.

In short, this preparation of hides is less expensive, since it requires nothing but bark which has been used, and unfit for any other purpose, but manuring lands or burning: and it appears a national object to establish it in preference to all others, on account of the consumption of grain which the barleied hides require; inasmuch that *M. Doublet de Perfan*, when *Intendant of Commerce*, used all his endeavours to establish it, and it were to be wished that this method generally prevailed.

On this occasion I cannot help relating a fact, which thoroughly proves the reputation of hides raised by bark; a person in office, and worthy of credit, assured me, that on a rumour of the establishment of *Liege* or barked hides, the shoemakers at *Paris*, fully convinced that the consumption would diminish, took the alarm, and employed many solicitations to put a stop to this innovation; a proof of the value they set on this kind of leather, and of the fears they entertained of seeing the public wants too seldom renewed for the future.

All that has been objected against this method is, that it requires an extreme attention, and that it sometimes fails by the vicissitudes of the air alone: they say besides, that it requires a particu-

the kind of water such as that of the *Meuse*, and therefore could not every where equally succeed; yet spring waters in general are nearly of the same quality; the spring of the manufacture of *St. Germain* succeeds wonderfully, and we hear no more of those frequent losses said to arise from hides filled by bark.

In 1749 a tannery was formed at *Bayonne*, authorized by letters patent of the 16th of May 1749, for the dressing of strong hides after the manner of those in *England*, *Liege*, and *Namur*: this manufacture succeeded, and the *Spaniards* preferred these hides even beyond those in *England*, from whence they were accustomed to get them.

This success encouraged certain merchants of *Toulouse*, to form a like manufacture at *Lez-Toulon* in 1751; they obtained from the king a piece of waste ground, and the inhabitants gave them the use of a public fountain; and they obtained a decree of council in 1754, calling it a royal manufacture, and exempting their chief workmen from serving in the militia for twenty-five years: it was also enacted that hides coming to them from foreign parts should be free from duty, and that those hides which they manufactured should be exported duty free. In fine, the great manufacture of *St. Germain*, is as universally known, as successful; and at these places all the hides are filled by bark, which proves the superiority of this method. In 1746, twenty hides were sent to *Paris* from *Corbeil*, raised and tanned after the method of *Monf. Teybert*; the master shoemakers of *Paris* were ordered by the ministry to inspect these new hides; ten shoemakers being assembled

assembled, having examined them, agreed upon the following report.

First. That the six called the *Transylvanian* hides were good, very well manufactured and the best of the whole.

Second. That of the fourteen others called *Walachian* hides there were seven good and seven bad, and that the defect of the latter arose from the quality of the skins and not from the tannage, which was perfect.

Third. That the *Liege* or bark-filled hides appeared to them in general to be preferable to the *Walachian*, because the more the first is wore, the more it hardens; whereas the *Walachian* leather is hollow, and loses by being kept.

Fourth. That the *Transylvanian* appeared to have the advantage of the *Liege* hides, but that appearances being often fallacious, they must refer to wearing, and experience.

Hides filled by bark are not in general as thick as barley hides; such shoemakers who think that the thickness of a hide forms its merit, would be deceived in appearances. The hide raised by bark is the softest; a whole hide may be rolled as a thin cow-hide; it may be beat for ever and will never extend under the hammer; cut a piece of any figure in the middle of a *Liege* hide, or hide filled with bark; beat it as much as possible, it becomes thinner and more compact, but it always preserves its length and breadth, and being applied to the place from whence it was cut out, it will not have spread under the hammer, but will exactly

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by the space again, which a piece of barley or lime hide would not do.

Limed hides or hides raised by lime, are known after being tanned, by a blackish colour on the grain side, red on the flesh side, and reddish in the cur. The barley hide has a fleatish colour on the grain side, whitish on the flesh and cut.

Of the Danish method of Tanning Hides.

This method of tanning which is practised in several places, and in particular in *Britany* consists in the tanning of hides in the space of two months, by sewing them round and filling them with bark. After the green hides are washed from the filth and blood, or if dry hides, steeped, softened, and the salt taken out, they give them a new pit to make the hair fall off; one month suffices for this, the hides are then polished, fluffed, worked at the river, and put into a red binder as barley hides are.

When the hides have taken the red, they are then to be tanned; for this purpose they are sewed round like sacks or bags, leaving only one side open, by which they are filled with bark and water, after which they are intirely closed up and well beaten, that the bark may be equally distributed throughout the whole; they are then put into pits filled with good tan water, so that the hides be totally covered, and may not grow black.

These *Danish* pits are from eight to ten feet in length, by four feet in breadth, and as much in depth; the hides being laid down, are strongly loaded with planks and stones, to force the bark juice

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juice contained within, to penetrate stronger and quicker; that the pressure should be equal and the tanning the same, they are turned three or four times a week, and carefully beaten each time: by this method, hides are tanned in two months, and with one barking; nevertheless it must be owned that this one barking is pretty near equivalent to the three that are made use of in the common method, when the hides are laid in pit.

The hides prepared after this manner are thinner than hides tanned in pit, because they are less swelled or filled, and the internal weight with which they are loaded, continually dilates and extends the hides; they are more supple and pliable than common leather, somewhat like cow hides, or smallest ox hides; it has the colour of upper-leather; that is, a clearer colour than strong leather, but it may be made darker with lime water after being tanned.

In the borough of *Locmine* in *Brittany*, there are above forty tanners who in general follow this method of tanning, which they perform in two or three months; there are also twenty-eight tanners at *Pentivy*, who follow the same method, and they call it *tanning after the Danish manner*; this method seems better adapted to thin hides, than to strong ones, and there are some provinces in *France* where they work the thin hides after this *Danish manner*: in short this method has such an affinity with the *English* tanning, it ought not to be proscribed, but encouraged and perfected, by paying more attention to it than has hitherto been done, and by filling the hides better for this kind of tanning.

Of thin Hides.

Cow hides, or small ox hides, which are not fit to make strong work, serve to make inward soles, womens shoes, upper leathers, and other works less hard than those in which strong hides are employed; cow skins are closer than oxen, and if they had sufficient thickness, would have the preference; but they commonly serve to make the weak leather.

At *Paris* they call these thin hides, *working leather*, (*Cuir à œuvres*) because the leather-dressers use it for several works, whereas strong hides are not susceptible of so many different forms; some call a thin, compact, and well tanned hide, fit to make soles for pumps, *Baudrier*, *Brigody*, and *Semelin*.

The *Baudrier* or thin hides remain in the lime pits but half the time allowed to the strong hides; these very thin hides are not filled by oak liquor, even in those tanneries where this method is made use of for strong hides. When taken out of the lime pit they are well worked in the river, that is, they are fleshed, and strongly drained on the beam, both on the grain and flesh side, four or five different times, and are rinsed each time to take off the lime; they are then put into the binding for eight days, and afterwards pitted for the space of four months only, that is, one-fourth of the time requisite for a strong hide.

In *Dauphiny* they make use of the *Danish* method to tan the *Baudrier* or thin hide, and it succeeds perfectly, because as they do not require the thickness

ness of strong hides, and the *Danish* method tending to diminish the thickness, is not so good for strong leather. When these hides have been *pit*ted two months, they are put into the binding vats for seven or eight days; they are then sewed up like bags, and filled with the binding liquor of the vat and with the bark which has boiled in it: they are thus left filled for eight or ten days, and are shifted five or six times a day; they are unsewed, and laid on the flat, in layers in the vat, with the same bark, and left for eight days without stirring; they are then taken out, dried on poles, and fitted for the leather-dresser.

In *Bresse* and the adjacent provinces, the thin ox hides, cow hides, calf skins, and other small skins fit for upper leathers, have but six weeks of the lime pit in summer, and two months and a half in winter; they are left for three days in running water, during which they are alternately worked with the knife and the stone, seven or eight times each day, until no lime comes from them, and the water comes clear.

The river work being finished, they are put into a vat with tan water, stirring them well several times a day to make them get a *grain*; but it is not always necessary to *grain* the upper leathers; and when treating of the leather-dresser or currier, I shall shew the difference between the turned calf and the oiled calf; those which they intend for the grain to, that is, for the grain to be on the outside, principally require the binding vat.

At *Limoges*, calf-skins remain four months in lime and three months in pit with oak bark, or two months with the bark of the *Rhus Myrtifolia*
or

or *Roudou*, as before described. In *Dauphiny* they remain but a fortnight in lime; but they are afterwards put into the vats with two different barkings for one month, and lastly in pit for six weeks. At *Metz* and *Verdun* cow hides remain eight days in a dead pit, eight days in a new pit, one month in vats with water and bark, and five months in pit with two different barkings; the cow hides make the black smooth leather for the top of coaches: as to calve-skins, it is the same preparation, except that they are not laid in pit but once during the six weeks. At *Bourges* the cow hides are three months in lime, and six months in pit. At *la Souteraine*, and at *Saint-Julien*, they are three weeks in lime, five or six days in wheaten bran, and fifteen days in a binding liquor of hot water, with bark.

At the manufacture of *St. Germain en Laye*, cows and small ox hides, after being cleaned, drained, polished, fleshed, and worked in three dead pits, and one live pit, pass through the fiver work with great care, at five different times. At the first operation the skins are put on the wooden beam, and cleared with the double handled knife, that is, they are strongly pressed to make the lime come out; then they are fleshed with a two handled round knife, and the hides are flung into the water to refresh.

At the second operation, the hides are again put on the beam, and the stone strongly passed on the grain side to soften it, to unite it, and make the lime come out, and they are then again flung into the water.

For the third operation, the hides are again put on the beam, and the round knife strongly passed over them, as well on the flesh as on the grain side, to press out the lime the better, after which they are cast into the river.

For the fourth and last operation, the same is repeated; and that is called *draining and watering*; if no more lime remains in the skins, and that the water comes out clear, they are put into the vat.

Of the binding Vat.

The *binding vat* is an astringent water, in which the cow and calve-skins are stirred for a long time, and in all directions, to strengthen and tan them. Oftentimes four men, or more, are employed in this work.

At *St. Germain* these *binding vats* are four feet high, and six feet diameter; they are made of wood, and heaped with iron; the skins are laid in with tan and hot water; four of the strongest men keep them continually stirring with shovels, from right to left, for one hour. Into each vat containing twenty-four cow hides, they put five baskets of tan; these baskets are twenty inches in diameter, and thirteen in height.

This *binding vat* work is several times repeated, taking the skins up each day, and draining them, before they are laid into the vat: whilst the skins are draining, a little fresh tan is added to the vat, to give it strength.

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When all the skins are turned over, they are left to *refresh*, and go through the same operation with fresh tan, till they are laid into the first barking. For this refreshment of twenty-four cows and twelve dozen of calve-skins, they add twenty-two baskets of tan, viz. ten for the cows and twelve for the calve-skins; for the repassing or *refreshing* require double the quantity of the *vatting*.

This refreshing is done in a vat in which the hides are extended at their full length; if the ends are by any means doubled, tan is put on the folds, and inclosed in fresh tan, wetted with a quantity of cold water, and thus they remain a month or six weeks, according to the seasons: when they are taken out of the repassing or refreshing, they are laid in pit as usual, but they require but two barkings, because the *vatting* or *refreshing* stand instead of a first barking.

Cow and small ox hides, after the *binding vat* and repassing, are laid down in *pit*; they are wetted with water; the softest are the best, and care must be taken they do not want it: at the end of three months, they get a second barking for five or six weeks; and after the second barking, they are brought to the drying place; they are there extended on perches, care being taken that the heat or cold does not seize them too suddenly: in this state they are said to be in *crust*, and are sold to the leather-dresser to make pump soles, black-grained leather, smooth leather, red cows, *Russia* leather, for saddlers, harness-makers, trunk-makers,

makers, &c. I shall describe them more particularly in the chapter on leather-dressing.

Cow hides, but especially heifer hides, being most compact, are best for outward soals; they are preferable to small ox-hides, which serve for the first or inward soals. Cow hides well worked generally pass for the best of leather, when well chosen; the heifer is best, because, if the cow has had a calf, the skin is more distended and thin: soals taken from a good cow hide, especially from the back, shoulders, and rump, are better than oxen: there are cow hides which weigh green seventy-five pounds, and twenty-five or thirty when tanned; but I must own they are scarce, so that the name of cow-hide is given by leather-dressers to all weak hides of oxen, cows, or calves. With respect to the refuse of a cow hide, such as the belly or other weak parts, they are not equal to those of an ox hide.

Of the working of Calve Skins.

Calve skins undergo pretty near the same operation as cow hides; they are passed in three dead pits and one live pit, with this difference, that calves being more delicate than cows, they are not laid in the pit until cow hides have been first passed in it.

When the skins are not green, but salted or dry, they must be trampled to render them soft.

The river work for calve skins differs something from cow hides; for from the second operation, fifteen or eighteen are put into a tub, where four men, with long wooden handled pestles, stamp

stamp them for half a quarter of an hour, to break the nerves, and soften them. This work is repeated after each operation, that is four times, as well as the river work.

When neither hair, flesh, or lime, remain on the skins, and that the water comes off clear, like cow hides they are put into the *binding vat*, and turned at several times, still more than cow hides, in different ways, and each time new tan is added.

The *repassing* of calve-skins continues about a month; they are placed in the vat with a little tan between each skin, and on the surface a little tan, and some of the *binding water* of the vat. It is in this *repassing* they continue until put into pits.

To *pit* the calve-skins, they are folded length ways, but unequally, and tan is put into the folds; a little more is put on the head, and towards the rump, these parts being thickest; the tan must be reduced into very fine powder.

The first barking lasts three months; when they are taken out, cleansed, and beat to take off the first tan; they then are laid into a second barking, observing also to fold them unequally, but after such a manner, that the part which was not doubled in the first barking, be doubled in the second; very fine tan is put between the skins, the softest water that can be possibly procured is poured on, and great care must be taken that they do not want it whilst they remain in the pits: this second barking continues three months, after which they are sent to the drying loft.

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At *Paris*, where the tanner and leather-dresser are two distinct trades, and jealous of their rights, the tanner has no more to do with his calve-skins, when he has taken them out of the second bark, except to prevent their drying; so that he does not bring them to the drying-loft, but ranges them on the edge of the pit with all their tan, in piles of five or six dozen; there they lie between two moistures, till the leather-dresser buys them to dress them in oil, and to prepare them for different uses.

About twenty years ago, some tanners succeeded in tanning calves and sheep skins in bark with hot water. I am sure it must have a good and a saving effect, by making the same quantity of bark go farther, as I have already observed on the subject of strong hides.

Of Goat and Sheep Skins.

Goat skins are not so common as to be had green in a sufficient quantity for a continued work, they are therefore bought in the hair dry, they are cast into the river to be softened, and trampled when taken out; they go into three dead pits, are polished, and passed in the live pit like calve-skins.

Such goat skins as are tanned, require at least ten operations in the river working, being themselves dry in their nature; I shall speak of it more at large in a treatise on *Morocco Leather*; for the river work is there observed with greater attention; and there is likewise this difference, that goat skins are worked in the river instead of tubs, except in the last operation, where tubs are

are used for the greater neatness. The hair of goats and calves is kept: goats hair (when grey) is sold for eight or nine livres the hundred weight, and for fourteen or fifteen when white. The pairings of the fleplings both of goats and of calves serve to make glue.

Goat skins go into the binding vat; they afterwards remain fifteen days in repassing; coming out of which, they are laid in pit once only; not being sufficiently thick to require a second barking.

It is in spring particularly that cow, calf, and goat skins are taken out of the pit; whereas strong hides are taken up in *Autumn*, being the season for shoemakers to lay in their winter stock.

Sheeps leather, or *Basil*, is a sheep's skin tanned; and these remain but three weeks or a month at most in the lime pit: if pits are made for this use alone, six quintals of lime are required for twenty dozen of skins. When the sheep skins are peeled, they require no more than fifteen days in the lime pit. After they are sufficiently filled, they are put into the cold binding vat, and there left for one month.

There are provinces where sheeps leather is made after the *Danish* method, that is, they are sewed all round, and filled with bark, and put into a new vat very hot, which is stirred from time to time, re-heated two or three times each day, and in two days the sheep skins are tanned.

Goat skins are worked in the river instead of pits, except in the last operation, where the

Of Horse Hides.

I have said that horse hides are not worked by the tanners at *Paris*; those in the country are not so nice; they do it when occasion offers; they give them six weeks liming, and five months pit, pretty nigh the same as cow hides; they are sold at eight or nine livres. A horse hide is known by the length of the neck, having a great thickness on the main, and very strong wrinkles: they are only used for first soals, which do not require so good a quality as outward soals.

Of the defects which are observable in Hides.

Bad leather is often owing to the bad quality or nature of the hide, and sometimes to the defects in the preparation: I shall run over the different causes of these defects in a few words.

It has been already shewn, that there are certain hollow, thin, dry skins, which are filled with difficulty, and consequently must be badly tanned. There are also skins cut and gashed with the knife by neglect of the butcher in slaying them; the large hides from the *Brazils* and *Ireland* are chiefly faulty in this point.

In sheep skins, the diseases incident to those animals often destroy their tender hides.

Some hides are pricked and flawed by muddy waters, or such as are loaded with acrid particles: there are some where the heterogeneous particles remain in the depilation: these hard parts resist the

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knife,

knife, and cause the cutting or galling of the hide in the working on the beam.

Some hides are burnt by lime to such a pitch as to tear under the pincers, or under the knife used in fleshing; this is an evident proof of the danger and abuse of using lime; against which I have already largely expatiated.

The bad quality of the bark, or of the tan, contributes also to that of the hides: old bark, full of crevices, covered with moss, blackness, or whose fire is extinguished by the moisture it has contracted, forms a bad tannage: the same holds good if the pits are not sufficiently watered: for the parts of the tan cannot penetrate the hide, if they are not dissolved so as to penetrate and soak into the hides.

The quality of the water greatly influences that of the hides, particularly during the scourings: the water of the river of the *Gobelins*, is so hot, flat, insipid, and almost corrupted, that at the manufacture of *St. Hippolyte* they are obliged to fetch two or three turns from the *Seine* each day.

The tanneries of the street called *Cencier*, being lower down the river of the *Gobelins*, have water which brings down the skins better, and is fitter for soft work, that is, for calf and goat skins, and the work is carried on much faster; six hours of water in the abovesaid street, does almost as much as twenty-four hours at *St. Hippolyte*, which is only three hundred fathoms distance, because in this interval the river hath loaded itself with a quantity

quantity of animal particles which disposes it to fermentation, and which it receives by passing through the different habitations of tanners, skinners, and dyers, with which this river is covered.

But as barley hides on the contrary require a harder and stronger water, the water of the river of the *Gobelins* becomes better at *St. Hippolyte*, and even there they are obliged to fetch water from the *Seine* at a great expence, to mix with that of the *Gobelins*: for the same reason hides raised by bark, which require a still stronger water, would not succeed on the river of the *Gobelins*.

By inspecting a hide raised by bark, it is known whether it be of winter or summer manufacturing; the summer hide is not so firm, because the scourings corrupting too soon, flatten and soften the hide, instead of dilating it: a fresh proof of the choice one ought to make of a fresh, quick, and pure water, for hides filled by bark.

Frost softens the nerve of the hide, therefore all tanners endeavour to preserve the hides from it, which they intend to keep in full strength; therefore, when they have sea-calf skins, or other skins, which are very difficult to soften, they are long exposed to frost: this softens and disposes them to be worked. I have shewn the effect of frost on scourings of barley; there the danger does not extend so far as to hurt the hides, but only to render the scourings useless.

They say a *hide* is *horny*, when certain parts of the hide, not softened in the preparation, have not been penetrated by the tan, and have remained dry and hard like *horn*: this would be the general defect

fect of all green skins, if the preparation was neglected, and they were left to dry of themselves in the air: the rounds of spectacles, and other common works, are made of horny leather; but is not used in those mechanick arts which require great strength and suppleness in the leather.

There are hides that have small imperceptible worm holes, which render a hide very defective. If such leather was on the top of a coach, the water would penetrate and rot the inward part of the carriage; therefore great care and attention is to be given to this by the leather-dresser; and that which is the most entire, most perfect, and largest, is the fittest for that work.

Hides gashed with the knife on the flesh side are very common, owing to the negligence of the butchers, as I have already said: to remedy this, they trim it on the flesh side, that is, they shave off a part of the hide with the knife; but if the cuts be deep, and it is necessary to scoop, so as to approach the nerve of the skin, the strength of the leather is too much affected.

The grain of the leather is also sometimes damaged by the filling, by the taking off the hair, and by the river-work. When the grain is cut and damaged, the shoe-maker ought to put the flesh side outward, and the grain inward, for the flesh will keep it a little from the moisture; whereas, if the grain be put outward, as soon as that is worn, nothing will remain to defend the rest of the skin, and the leather will take the water with the greatest facility.

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The shoe-maker ought to make use of the belly, neck, and part towards the legs, they are weak parts, at least for work that requires strength; if the leather was soaked and beaten before it was worked, it would be much more durable.

Of the Making Tan Turfs.

The tan, or old powder of bark, taken from the pits after the hides are tanned, serves those who raise or fill hides by bark, to make their *sour liquors*, or *onze*, or juice of bark: but to those tanners who fill by lime and barley, it only serves for fuel; and to use it with more conveniency, it is made into turf.

The turfs in *France* are cylinders of five or six inches diameter, and of two or three inches in height, made of tan kneaded in a mould, and dried in the sun, upon thin ledges placed about the drying-loft. The moulds are made of brass, on which a man tramples, to harden the tan.

In *Provence* one man makes about one thousand per day, for which he is paid thirty *sols*. At *Paris* they make more; but they are smaller and less compact. The tan turfs in *Provence* cost three livres the thousand, including making, laying, and carriage, and they sell them for six livres, so they have but three livres profit for every thousand of tan turfs. A tanner, who consumes two thousand livres worth of bark, does not make fifty thousand tan turfs; worth about one hundred and fifty livres; so it is evident, that the tan turfs only return about one thirteenth part of the first cost of the bark.

At the tannery of *St. Germain*, they make about four hundred and fourscore thousand tan turfs *per annum*; but the greater part is consumed in the house: this is the produce of about eight thousand puncheons of tan, each puncheon two hundred weight. But the greatest part of their tan does not go to turfs, as they give their workmen the larger pieces of bark for their profit; this gross bark, when dry, is very good to burn, and as it could not be made into turfs, they carefully pick it up at the emptying of the pit, and of the dead workings, in which there is a great quantity.

Another use the tan is applied to when not made into turfs, is for the gardeners; they buy it sometimes at six livres the cart-load, for beds, and hot-houses, as it preserves a gentle and constant heat, such as is required for the exotic plants of *Africa* and *South America*.

According to the following calculations, the tan of fifty hides, reduced into tan turfs, produces twenty livres clear, and the first cost is three hundred and thirty-seven livres, so that the tan produces only the seventeenth part of the price of the bark.

Of the Expence and Profit of Tanneries.

N. B. The following calculations being made in French weight and money, it may not be amiss to advertise the Irish tanner that one hundred pounds French, makes 108 pounds English *averdupais*. One shilling English is equal to 22 sols, 10 den. and $\frac{2}{3}$. 1 French livre consists of 20 sols: each sol 12 deniers Paris, and

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and 15 den. Tourncois. One penny sterling is equal to $13\frac{1}{2}$ deniers Tourncois: so that the English pound sterling is equal to 13 livres, 6 sols, 8 den. of French money, supposing the exchange to be on the foot of 54 pence sterling, to a French crown of 60 sols Tourncois.

The detail I am now entering into concerning the œconomical part of tanneries, is chiefly taken from the report of M. Guinard, inspector of the tanneries, in 1750, to the council. There may be articles which perhaps at this time may vary, but it is difficult for one not of the profession to know thoroughly such minute details; besides from one province to another there may be great varieties; the following calculations will serve as a model or example of the method of making such like estimates.

A tanner who in our province has two pits of seventy-five hides each, and manufactures one hundred and fifty strong hides yearly, must have three workmen, which will cost about twenty-four sols a day each; he must expend for bark 2000 livres; it is certain with that quantity he may tan more thin hides, which may encrease the profit: but we will only examine the expence of the strong hides.

Of Hides filled by Lime.

EXPENCE. I suppose a lot of fifty large hides, green from the butchers, weighing at a medium 80 pounds each, the prime cost will be 24 livres each, the sum total makes 1200 livres; the interest of which, at six per cent. for two years, is 144 livres;

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the price of tan 337 *livres*; the workmanship at the rate of 16 *sols* for each hide, 40 *livres*; lime, 15 *livres*; the total expence will then amount to 1736 *livres* for fifty hides.

PROFIT. The fifty hides, which weighed in the hair, and whilst green, fourscore pounds at a medium, lose commonly about half in the dressing, and seldom weigh more than forty-four pounds a hide when tanned; therefore fifty times forty-four pounds, makes the total weight twenty-two quintals of tanned leather, (each quintal one hundred pounds) which valued at 16 *sols* per pound, will produce for the amount of the sale, 1760 *liv.*

There are also some profits on small articles, as on one hundred horns, which commonly are worth 8 *livres*, one half for the men, the other for the master, 4 *liv.*

The tail hair, 6 *liv.*

Two hundred weight of hair, at 4 *livres* the quintal, half only belonging to the master, 4 *liv.*

The fleshings and pairings of these fifty hides, make fifty pounds of common glue, bought by the paper-makers, at 10 *livres* the quintal; deducting the washing and drying, we may allow for this 50 pounds of glue, 4 *liv.*

The lime used for these fifty hides, being the ordinary lime for foundations, or for manure, will produce 4 *liv.*

The tan of these fifty hides made into turfs for fuel, or sold for manure, or for the gardeners use, will produce, 20 liv.

The total of these small articles amounts to 42 livres, which being added to the product of the principal sale, makes 1892 livres. Now we have shewn that the expenditure was 1736 livres, so that the profit of these fifty hides, *raised by lime*, will be 66 livres only; which is much less than the profit accruing from barley hides, which I shall hereafter prove to be 211 livres in fifty hides.

Of hides after the Danish manner.

EXPENCE. The workmanship of fifty hides, done after this manner, costs less, because it is shorter than any other way: it may be valued at 12 sols each hide, which in the total makes 30 liv.

A new pit, which requires 2 barriques of lime, at 3 livres 10 sols the barrique, will cost 7 liv.

The red and barking will consume one hundred and fifty quintals of bark, at 2 livres and 5 sols the quintal, 337 liv. 10 sols.

The cost of fifty hides in the hair, at 24 livres each, 1200 liv.

The interest of the money may be here omitted, because of the short time it takes in its return; so that the total disbursement is 1574 liv. 10 sols.

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PROFIT.

PROFIT. The fifty hides which weighed eighty pounds when green, will only weigh forty when tanned. Hides thus prepared, being lighter than when done after any other manner, because they are thinner, drier, and less swelled or nourished; so that the total weight of these hides, at 16 sols the pound, will produce

1600 liv.

To which must be added the small articles, as before,

42 liv.

Total value of fifty hides, made after the *Danish* manner,

1642 liv.

Deducting the prime cost and expences, 1574 livres 10 sols, there remains for the total gain

67 liv. 10 sols.

Almost equal to that of limed hides; but this return comes about three times oftener, and consequently becomes three times more profitable, if at the same time it is supposed, that hides thus prepared, are as good as limed hides, and may have as quick and considerable a sale.

Of Hides raised or filled by Barley.

EXPENCE. The workmanship of fifty barley hides, is equal to that of limed hides, rated at 16 sols each hide,

40 liv.

Half a measure of barley for each hide, at 14 sols; for the fifty hides

35 liv.

The

The *red binding* of fifty hides takes two *quin-*
tals of bark, which may be valued at 45 sols a
 quintal, 4 *liv.* 10 *sols.*

The tan sufficient for the pit, pretty nigh that
 of limed hides, 337 *liv.* 10 *sol.*

Prime cost of the fifty hides, at 24 livres
 each, 1200 *liv.*

The interest of this sum for the year, at 6 per
 cent. 72 *liv.*

The total expence is then 1689 *liv.*
 which makes 33 livres 15 sols for each hide.

PROFIT. The fifty hides, weighing each four-
 score pounds when green, will only weigh forty-
 four pounds when tanned; which will produce,
 at the rate of 17 sols per pound, 1870 *liv.*

The small profits of 4 livres for the horns, 6
 livres for the hair, and 20 livres for the tan, come
 to 30 *liv.*

Therefore the total of the produce of fifty bar-
 ley hides is 1900 *liv.*

And the profit of the tanner will be in one
 year 211 *liv.*
 a sum exceeding the limed hides by 145 livres;
 for it is supposed that barley hides are sold at a
sol more, being of a superior quality to that of the
 limed hides; besides, the interest of the money
 is only lost during one year for barley hides;
 whereas it is lost, at least for two years, to those

who manufacture limed hides. The profit of hides raised by bark is yet more considerable.

Of the preparation of Hides after the method of Walachia and Transilvania.

Hides of *Walachia* being prepared by warm scourings, we must add the expence of fire, which in some places is considerable: a little salt must also be added to the scourings: in short, according to M. *Guimard*, it is somewhat more expensive than the common barley hides, but the difference is not very considerable.

The same may be said with respect to the *Transilvanian* hides: rye in grain weighs eighteen pounds a bushel *Paris* measure; and it requires a little more than a bushel for each hide, which amounts to 15 sols; so that it costs as much for rye as for barley.

Of Hides prepared by oak bark liquor, called Hides of Liege.

Hides prepared after the manner of *Liege* require neither fire or barley, which makes a considerable saving; the workmanship may be supposed somewhat dearer, because it requires more skill and attention.

EXPENCE. The labour of hides filled by bark is about 20 sols each, so that a set of fifty hides comes to

50 liv.

The bark grossly ground, which is used in the last of the twelve common scourings, and in the extraordinary scouring, may in the total be three quintals

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quintals; which at about 2 livres 5 sols the quintal is 6 *liv.* 15 *sols*.

These fifty hides tanned in pit, according to the preceding methods will require 150 quintals of bark, which at the rate of 2 livres 5 sols each, will cost 337 *liv.*

The price of fifty hides in the hair at 24 livres each 1200 *liv.*

The interest of the 1200 livres during the time of the manufacturing, which is one year, at 6 per cent. 72 *liv.*

Thus the total of the expence is 1666 livres, instead of 1736 livres, the expence of the limed hides.

PROFIT. Fifty green hides supposed to weigh eighty pounds, will only weigh forty two pounds when tanned, total 2100 pounds at 18 sols the pound, which is the lowest price it will bring 1890 *liv.*

N. B. At *Paris* and at *Nantes* these hides commonly sell for twenty and twenty-two sols a pound, if the hide be large and strong.

One hundred horns, which are generally sold at 8 livres, half of which only come to the master, 4 *liv.*

The hair of the tails of these fifty hides, 6 *liv.*

The hundred and fifty quintals of tan which comes from these hides, produce 20 *liv.*

The

The total of the product is then 1900 *liv.*

And the profit 254 livres, which makes more than 15 per cent of the principal sum of 1666 livres.

In this last I have allowed nothing for hair and cuttings. M. *Guimard* says, that the hair of hides raised by bark is not good; whether it be that it rots sooner than hair limed, if neglected to be washed and dried; or whether it be that the lime gives it a better quality, I know not, but it is worth making experiments in this matter. The pairings of hides raised by bark are not fit for glue, because they are too fat; but they might serve to feed large dogs, and their fat substance might also be taken off to fit them for glue, by laying them some time in lime.

According to these calculations made by the *inspector of commerce*, a tanner who manufactures a thousand *Liege* hides of forty eight pounds, at 22 sols the pound, would gain on each 8 livres, 9 sols, and in the space of fifteen months 8400 livres profit, without the glue, horns, hair, and tan, which must yield at least 600 livres more.

The 600 livres in small profits are, according to this *inspector*, thus; for horns of 10 livres the hundred weight, 200 *liv.*

Fourscore quintals of hair, at three livres the hundred weight, which makes 240 *liv.*

Five

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Five thousand tan turfs, at 10 livres the thousand of which fifteen sols must be deducted for the making 154 liv.

The parings of one thousand hides, at 12 livres the hundred, and which weigh above two ounces each, 18 liv.

Five quintals of ears and fleshings, at 3 livres the hundred, 15 liv.

Total of the small profits 627 liv.

Added to the former produce of 8400 livres, and deducting 1000 livres for the maintenance of a horse and other necessary utensils, with 1500 for the rent of the tannery of 16 or 17 pits; there will remain about 6500 livres clear profit for 15 months, or a net revenue for each year of 5200 liv.

All the valuations I have seen made on the produce of tanneries, tend to prove the advantage in hides raised by bark; it is in quality best; it sells better, and the cost is less; more sufficient reasons cannot be given to adopt its use; but the obstacles are great, namely the ignorance of the tanners; the defect of emulation amongst them, and that invisible monster, *custom*.

Of the price of English Hides.

The finest and best filled *English* hides, weigh from 60 to 70 pounds, (avoirdupoise) or of 46 to 65 pounds *French*; they cost in the hair 30 or 40 shillings, that is from 34 to 46 livres; and when they are tanned, they are sold at about one shilling

shilling a pound, which is pretty near 25 sols the pound, money and weight of *France*; this is very near the price of hides raised by bark in the adjacent parts of *Paris*.

Of Hides imported from foreign Parts.

The consumption of hides in *Europe* is so great that they are brought from *Asia*, *Africa*, and *America*: but the hides from the *Brazils* are in the greatest estimation. In 1710 *Spain* granted to *France* the commerce of *Buenos Ayres*, and then the *Assiento* company brought the dried hides from *Buenos Ayres* directly to *France*; for they looked on them as preferable to those of *Barbary*, *India*, and *Peru*. But by the treaty of *Utrecht*, this commerce was ceded to the *English*, excluding all other nations; then, the *English* became sole possessors of the hides of *Buenos Ayres*. The *French* could not even draw them from *England*, for by an arret of the 6th of *September*, 1701, the drawing of merchandizes from *England* was prohibited, except of the growth of *England*, or composed of the growth of *England*, *Scotland*, and *Ireland*; and then our merchants, bought up these hides in foreign countries, from whence they imported them into *France*.

In 1724 an arret of council permitted us to bring the dried hides of *Buenos Ayres* from *England*, paying for each a duty of 25 sols on their entry into the kingdom. The duty was 50 sols on the hides of *English* bullocks, but these being of a quality very inferior to these of *Buenos Ayres*, did not seem to deserve the same favour, and remained loaded with a larger duty, that their introduction should not be preferred to those of *Buenos Ayres*; and

and to prevent confusion, it was ordered by the same act, that on the importation of these hides from *England* to *France*, the merchants should be obliged, at their arrival, to declare them such, and to get a certificate in due form from the Directors of the South Sea Company, certifying that these hides were really such, and come out of the sales of the South Sea Company.

Since *Portugal* has made a treaty of commerce with *England*, we are again deprived of the *Brazil* hides, and the *English* being also masters of *Canada*, the commerce of foreign hides is prodigiously diminished in *France*.

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Of alumed Calve Skins for
Book Binders.

CALVE skins and sometimes sheep skins are dressed for book binders; in 1765 they sold at *Paris* for thirty-eight *livres* a dozen: the grain of these is very entire, they are worked in lime, and with *confit* or *masserings*, fleshed thoroughly and sleeked with a hot iron. The art of dressing these skins is kept a great secret in *France*, being only made at *Verneuil* in *Perche*, twenty-three leagues south of *Paris*, and at *l'Aigle* in *Normandy*. *M. Desmarests*, inspector of manufactures, being on his visit to these places, solicited some instructions from the subdelegates on this subject, in vain; they seemed to lay the greatest secrecy on it; a narrowness of mind not to be forgiven in the meanest class of artists.

But *M. Drouin* and *M. Moffatre*, both eminent merchants at *Verneuil*, gave me such insights as are by no means to be despised; and which with a little practice will certainly bring the tanner into the method of dressing these skins.

Verneuil contains about 3500 inhabitants, whose riches and commerce chiefly depend on alumed calves. Messrs *Droine* and *Loche* furnish each year to *Paris* 300 grosses, or 43200 skins. A branch of the river *Ilou* is carried through *Verneuil*, which furnishes

furnishes all the water necessary for this work, and they pretend that the quality of this water is peculiar for the working of *alumed* calve skins.

For this kind of leather they chuse *flink calves*, and other small skins which do not cost more than eighteen *livres* a dozen in the adjacent parts of *Paris*. The large skins are not used, unless they be very thin.

The calve skins are bought up in a dry state (supposed the fitter for river-working) being first carefully examined, whether they be corroded by insects, called *weevils*, which make furrows on the grain, and do considerable damage to the skins: such as are found impaired are first worked.

To preserve the parcels of skins from insects and dust, it is necessary to beat them well with a wand when opened. This operation is needful once a week in summer, and less often in winter. The place in which they are kept, should be neither hot nor moist.

Thirteen dozen of skins, called an hundred and a half, with an allowance of four to each hundred, are worked at once, and make what is termed a coop and two tubfulls.

The dry skins are softened by being laid in a long oval trench or pit, ten or twelve feet long, by three or four in breadth, and six in depth, dug in the ground, and into which the water is made to flow, by an oval slip, eighteen inches in height, but so narrow as to prevent the skins from floating away, the water is contrived to run out again by another cut of the same shape. In this constant course,

course of water, properly enough called the *change*, the skins lie two or three days in summer, and six or seven in winter.

When taken out, they are heaped, and the following day they are *broken*, that is, they are opened on the beam on the flesh side with a blunt knife, working the head and thick parts more than the rest, to render the whole equally pliant and supple.

This first work being done, they are put into water for two days, and then taken out to have the same operation repeated. If some are found not to be sufficiently softened, they are put back into the *change* pit for one day; all these operations are performed to render them as soft as if just flayed from the carcase, after which they are put into the *lime* pit; this is a hole dug in the ground to the depth of four or five feet, according as required, and broad in proportion: they put in forty or fifty pails of water, to a tun of lime, which is left to *slack*; twelve or fifteen hours after it is stirred with a wooden rake; fresh water is added, it is stirred again, and such skins as are ready are put into this new pit, one by one, a workman sinking them with a perch as another takes them from the pile; they are left in the pit a whole day, and sometimes more, as necessity requires; as they are taken out, they are piled, and well stretched out, laying the head of one to the tail of the other. These are limed first in a weak pit, the next day in a stronger limed pit, and so on, *piling* and *pitting* them until the hair peels off easily, as I have already described in the preceding part of this work.

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When fit for peeling, they are put into another pit, without stirring the lime, to wash them; and to take off the lime with which they are loaded; they are then brought to the river to be washed and to be immediately peeled, observing to separate the white hair from the red, as the first sells much dearer. They are put into the *change* pit during the night, having first introduced a pole about the thickness of a man's leg, lengthways in the pit; at the extremities of this pole are two chains, fastened by staples, in order to raise or lower it; on this are laid the skins that have been peeled, and here they steep the whole night.

When the skins are soaked, the *flesher* takes them out as he wants them, laying them on the beam, with the heads downward. For this purpose a very sharp knife is used, that they may be fleshed to the quick, so that the flesh side is scarcely to be distinguished from the grain; they are pared much closer than any others we have spoken of; the throat and the head are rendered as thin as the remainder of the skin, cutting off the ears, the tails and other extremities. These superfluous parts serve to make size for sizing the chains of woollen stuffs; they dry this size on tiles, spreading it very thin, and when it is thoroughly dry it scales off; it is sold from thirty to thirty-five *livres* a quintal. The first operation ended, they return the skins at night into the water of the *change* pit; and the next morning they flesh them on the beam with a much blunter iron than that before mentioned, so as to take off all the flesh. After which they are again returned at night into the *change*. On the next morning, three workmen beam them a third time, to give them a grain, and

to take out the lime. By eight in the morning this work is finished; and whilst they are at work, a fourth workman lights a fire under a copper kettle, to heat water and to *alum* the skins.

To *alum* them, put into a large vat three or four pails of dogs turd; which three or four pails contains about the quantity of two common buckets of the water-carriers at *Paris*. This dogs turd is called *alum*; if they have not sufficient, they mix hens dung; but this is too *quick*, and must be used with precaution; on this dogs turd they fling a large pail of water to dilute it; this done, the workman goes into the vat, and with his wooden shoes he tramples and tempers it, filling the vat half full of water. The *alumer*, on his part, pours water out of his boiler into this vat, mixing it with the cold water; after which, he flings in the skins, stirring and turning them for some moments with great sticks; this done, they take out the water of the vat to heat in the boiler, leaving the skins one hour in the vat, pressed into one corner of it, and confined there by means of two sticks laid across; the water is taken out of the boiler pail by pail, and poured into the empty part of the vat, stirring it well to mix with the cold, and to prevent its scalding the skins. When the water has acquired a proper degree of heat in the vat, the cross sticks are taken away, and the skins are stirred and turned with strength, three several times.

The liquor is taken a second time out of the vat and heated in the boiler, and after half an hour's rest, the *alumer* draws them towards him confining them in the corner of the vat with the sticks; he examines those that are thinnest, and
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what progress they have made, adding warm liquor in proportion as he sees them advanced: this water must be no warmer than to bear the arm in it, plunged to the bottom of the vat. The cross stick being taken from the corner, they are stirred briskly; the boiler must always be kept full, and the arm plunged from time to time in the vat, to know whether the water cools; in summer more precautions are to be taken than in winter.

A quarter of an hour after, the workman gathers the skins to his side, puts the cross stick to the quarter as before, and attentively examines the state they are in, opening them length and breadthways, and when he finds that they yield and lengthen well, and appear as if ready to melt, it is time to take them out; one or two dozen are first lifted out, which are put into pails, after which he empties the water as above, and turns them three or four times, and fills the boiler; a quarter of an hour after, he draws them towards him again, puts up the cross, and takes a greater number out of the vat. Here lies the whole judgment of the operation, for if any thinner than the rest are left in this liquor too long, they would be melted, as some skins are more difficult to work than others, it happens, that some are fit to take out, while others are far from being so; it sometimes requires six or seven hours before the strongest are *alumed*, which causes the same operations to be repeated, by constantly augmenting the heat to the end of the work. As they are done, they are put on the *beam*, and are pressed with the iron on the flesh side to lengthen and cleanse them; if seven or eight should be found stiffer or firmer than the rest, they must be left in the vat whilst the other are draining.

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When they are all taken out of the vat, the water is emptied by the discharging hole, and being well washed, it is half filled with river water; the same skins are rinsed in it one after the other, and turned about three several times with sticks, after which a basket of tan is added, and they are stirred again; this done, the *alumer* draws them towards him, repasses them under his hand, and puffs them to take out the stains of the tan, turns them three times in the vat, and leaves them.

The next day, a woman takes out the skins, and puts them on planks to drain; after which she brings them to her work-shop, where she examines them one after another and sews with a common needle those small holes made in the skin, by the knives of the butcher, or flesher. she then sews up the body of each skin in the form of a budget or bag, except the tail part, leaving the flesh side outward; she uses for this purpose a small square needle made for this use, and flat at the point, with double thread; taking one side of the skin, at one sixth of an inch (to two *lines*) distant from the edge, and the other at half an inch (or six *lines*); she turns them down like a hem, but without tightening it, so that the water may go out gently; for in tightening the seam too much, a kind of black horn would be formed all round it; the *vat-man* turns them out, and puts into each skin a quantity of tan proportioned to its bigness. This done, the woman sews the tail part, leaving a space for the entrance of the copper neck of a wooden funnel. After this the *vat-man* conveys the skins filled with tan near his vat, and flings those skins which have been in the
vat,

vat, on a rack, to unstick them. The vat must be half filled with *auvergne*, which is nothing more than water taken out of another vat in which the skins have been emptied of their tan, that is, in which the tan has been put, with which they had been filled; to draw the water clear out of this vat, (which is oval, as are the two others) they make a door at the end to form a valve, whilst the vat is full of tan, and the tan water filters through the door, which is heated in a boiler before it is emptied in the vat where they are to be vatted.

When the water that has been emptied out of the tan vat into the boiler is sufficiently warm, (that is lukewarm) it is poured into the vat in which the skins are to be vatted, mixed with cold water that was in the vat.

The vatman takes one of his skins, and by the means of his funnel, he pours in a small pail of water, ties it with a small slip of skin left for that purpose on the tails, and when he has filled them all with the like quantity of water, he lets them rest for one hour. In the mean time, he heats other water, which he draws from the same vat he took the first, placing a rack at one end of the vat to hang on the skins, from whence he takes them, and fills them as full as he possible can by means of his funnel and little pail, tying them fast that the water may gently filtrate itself through the seams; this operation causes the skins to swell like foot-balls, and they form a pyramid in the vat. This operation is repeated a third time, letting them rest one hour each time, and giving always a new degree of heat. Attention must be given to the degree of liming the skins have received,

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ceived, that is, to give less heat to those which have been much limed, and more to those which have had less of the pit; this requires much experience in the vatman.

The ensuing day the same operation is performed in a third vat, whilst the skins of the preceding evening are left in their vat, to feed on the tan with which they are filled. Two days after, all the skins are taken out of the first vat and drained on the rack which is supported by two small joists, supported on the edges of the vat. When they are drained, they are flung on the rack of the vat, where they are to be unstitched and emptied of their tan, and as fast as they are unsewed, the flesh side is doubled inward; they are brought to the river side, when they are washed on the grain; another workman puts them cross-ways on a *trestle*, where they are left to drain, after which they are brought into a drying loft, where they are opened by the two hind pattes and hung the head downwards, on nails six inches distant one from the other.

When they are very dry, they are piled, and thus left till the time they are sent to *Paris*. When they arrive at this market, if in summer, they are exposed to the dew, and early in the morning the workmen trample on them with wooden shoes, to beat down the seams; they are stretched in all directions and rendered as supple as gloves.

This operation from the skin in the hair requires six weeks in summer, and in winter eight at least.

It may have appeared extraordinary to see the word *alum* used in *France* for *mastering* or dogs dung; without doubt they formerly passed these skins in *alum*, and they have preserved the name of a work forgot.

I have said, that in default of dogs dung, they sometimes used that of hens, which almost produces the same effect in a stronger degree; this substance takes down the skins, and corrodes them so much that they might be taken for thin linen, and the light is seen through them; so that, if a workman be the least negligent, the water too warm, or the skins too much soaked, the thin parts will tear, either in the vat, or at the book-binders.

Thunder and fogs are prejudicial to these kind of skins, and they endeavour to work them, as much as possible, in spring and autumn.

Hog skins are worked after the same manner to cover large church bibles; these are the most durable.

Basils or tanned sheep leather for book-binders, are not *alumed* like calves, they only require *liming* and the *vat*: the working is pretty much the same as that of calves. There are *basils* worked after the *Danish* manner, and *basils* laid in the tan pit; the first are sowed round like the calves; the others are not sowed as in the *vating* here mentioned.

The tanners of *Verneuil* and *de l'Aigle* are persuaded that the quality of their *alumed* calves, proceed from the quality of the water which is soft, and they would persuade us this leather can be made in no other place. It is true they have made experiments at *Paris* that have not succeeded, yet I am certain that by a little more experience we shall excel them. M. *Barois*, director of the manufacture of *St. Hippolyte*; proposed to undertake it, when the tanners of *Verneuil* combined to augment the price of their skins. The market price is from twenty *sols* to twenty-two *sols* a pound.

The reasons given for this augmentation of price are, 1st. foreigners buy up our best skins, which causes the remainder to be extremely dear: 2d, the *Britons* kill their calves at eight or ten days old; if they kept them only to the age of one month, it would be a great relief, for at this very time when they want to sell them by weight, those flink skins which weigh but one pound and a half would weigh two pounds or two pounds and a half; 3d. the tanners give two or three years credit to the book-binders of *Paris*, with whom they run great risks: so that rich merchants only can carry on this commerce.

Messrs. *Drouin* and *Loche* of *Verneuil*, send each year to *Paris* about three hundred gross of *alumed calves*, (that is forty-three thousand two hundred) and send them up every three months; those of *de l'Aigle* make much less, and have no fixed time for their sale.

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When the book-binder makes use of these *alumed calves* he soaks them in water, twists them, shaves them on a stave or convex board in the shape of a beam, with a knife like a dagger, made of the blade of a broad sword, with two handles; it does not cut, but only extends the skin, thins it, cleans it, and takes off the tan that might stick to it.

The skin being cut up in small pieces, they are extended upon smooth polished stone to be pared on the flesh side, on the edges and other thick parts: the paring knife is much like a carpenter's chissel; it is very sharp and very thin: it is now prepared to be pasted on the boards of the book, so that the book-binder performs some part of the currier's business.

O F T H E

Art of Currying Leather.

WHEN the tanner has given the necessary consistence and firmness to the leather, several operations are still necessary to prepare it for the different purposes it is to be applied to, and this is the business of the *Currier*. In country places, all tanners are curriers: at *Paris* they form two separate corporations; yet there is such a connection betwixt these two trades, that a treatise on tanning would be imperfect without the art of currying.

There are some kinds of leather that take their name and use from the work of the currier, such as *Russia* leather, so that its process consequently falls under this chapter.

The appellation of *Currier* is derived from the *Latin* word *Coriarius*, a worker in leather; and altho' this etymology be general, the signification of the word is determined by use, and is applied to those only who work the leather already tanned, either in oil, in tallow, or in colour, who give it a lustre, suppleness, and a fine grain. Some think

the word *Currier* is derived from *corrugare*, to wrinkle, because the currier gives wrinkles and grain to his leather.

The currier receives his leathers from the tanner, and he sells them to the shoe-makers, saddlers, coach makers, harness-makers, trunk-makers, case-makers, and book-binders ; all have occasion for the currier, they require leather more or less strong, and variously dressed ; these different dressings constitute the art I am about to describe.

Curriers finish bullocks, cows, calves, sheep, and goat skins ; sometimes they give to those last the name of *maroquins*, not *Morocco* leather, for that is an operation will require a particular treatise. As to the hides of horses and mules, they are chiefly used by the *Hungarian* tanners, who serve them with alum and tallow to make what is called the *German leather*, which also shall be described in a separate treatise on *Hungarian* leather, as curriers seldom dress horse hides.

I have been informed that in some parts they curry strong hides with the paumelle and iron sleeker whilst they are still wet ; this strengthens them, and makes them more beautiful, but the work is extremely laborious : I think the same effect may be produced, by well beating the strong hides, as mentioned in the art of tanning. Some curriers put their strong hides in tallow ; to prevent their soaking the wet, but in general the strong hides do not come under their hand, the trade being confined to cows, calves, sheep, and goat skins.

Curriers

Curriers call all *thin* hides cows; whether of cows or small bullocks; yet they distinguish them into male and female cows: the female are more esteemed than the male, being more firm and compact than those of young bullocks. In general, of thin hides that are worked, those of cows succeed better than bullocks, whereas among strong hides the bullocks are the first; the name of hide in *France* seems consecrated to oxen; thus also they distinguish the *hide* tanned and curried from the *cow hide* tanned and curried (though the work be absolutely the same), according as an ox or cow hide has been used.

These dressings of oxen or cow skins are distinguished by curriers into *harness* and *saddle leather*; *shoe-makers* and *coach-makers leather*; *waxed leather in tallow*; *black sleek leather*; *waxed leather*; *English* and *Russia leather*. I shall first describe the general operation of the currier, and then enter into a detail of the different kinds of leather manufactured at *Paris*.

They begin by paring or rounding the cow hides, that is, they cut off the tails, the foreheads, and the dugs; these parts, being hard and horny, would only spoil the knife, and blunt its edge, without being beneficial to the use the skin is intended for; besides they would absorb the tallow without profit. They also cut off small pieces towards the hind parts where they expect any wrinkles; these parings and small pieces are not useless; the shoe-makers use them for heel-pieces, for lining and for raising their lasts.

Of the Method of softening Hides.

The first work common to the different preparations of the currier is to soften his hides with water, and to trample them with the heel or with the *pin-block*, the harness-leather excepted, which is not to be trodden.

The currier receiving a hard dry skin from the tanner, begins to briskeen it, by sprinkling the skin with a broom dipped in clear water. In this work firm and porous skins should be distinguished; the last requires less wetting than the first; the driest parts are wetted most. The skin being sufficiently wet, it is trodden under foot, till such time as 'tis thought the water has equally penetrated every part, and the skin is supple enough to be worked; for greater neatness they should be trodden on a hurdle.

The hurdle is composed of a frame of six pieces of wood, of about three inches square: the two sides are five feet long; the cross ones three, tenanted into the side pieces at equal distances. The four cross-pieces are interwoven with large twigs so as to form a hurdle.

The skin being flung on the hurdle, is beaten and bent in all directions under the feet, treading it with the heel, for a quarter of an hour, or longer, until it be sufficiently softened: the left foot holds it, whilst the right heel drives it back with strength. This is commonly the work of apprentices, as it requires no art: for this purpose they are provided with thick shoes, made of three soles

soals of the best leather, and strengthened on the upper leather.

The *pin-block* is used to ease the feet; it is a block of wood of five inches square, and four inches and a half thick, containing four wooden pins or small feet, each one inch and a half in length, with which the leather is beaten, and a handle of two feet and a half; so that it resembles a carpenter's mallet with four pegs in one face of it. Cow hides are always beaten with this instrument, when put in black, especially when the skins are very hard; but the treading must not yet be omitted, that the skin may be soft and pliable.

When sufficiently softened, they are worked on the *wooden horse*, *leg*, or *beam*, after different manners, according to the uses they are intended, and with different kinds of knives. The *French* curriers use three sorts of knives, called three-quarter knives, half knives, and quarter knives.

The three-quarter knife has two handles, is strait, and the blade three fingers in breadth; this does not cut, it serves only to cleanse those parts of a skin which the next knife might weaken too much; it only takes off the stringy particles and those loaded with bark, which hold but lightly to the skin. This instrument is commonly made out of an old knife.

The half knife serves to flesh the skins neatly, without taking off much of the flesh; this is a cutting knife, and is generally made of the blade of an old broad sword, in shape like the first.

The quarter knife is broader, its blade being fifteen or sixteen inches long and five or six inches broad: its edge is extremely taken down or cambered; it is laid upon the skin with its blade perpendicular to the skin, the edge downwards, in such a manner that the edge alone takes off the light layers of the skin, until they be every way equal to the neck; they sometimes take off two or three layers, when they want to bring down the skin, that is, to make it very thin, for the sadlers use.

This quarter knife has one of its handles placed like a cross, or perpendicular to the blade, that it may the more easily be conducted strait over the skin; this is done by a butcher's steel, which lets down the edges of this knife, the one above, the other below; that thus it may serve to cut on both sides. This knife costs from 15 to 18 livres, as it is of importance to the curriers to have it good.

It is with this last knife that the currier performs his second operation, which consists in taking off the flesh side throughout the surface of the skin; this is done to those *cows* that are intended to be put in tallow or oil, to smooth and make them thinner; it often happens some parts of skins are thinner than others, from these parts no flesh is to be pared off, but only to be cleaned by strength.

The *leg* or *beam* is four feet in length, the board is seven inches broad, convex, and sometimes so thin as to be springy; but it is better it should be firm.

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Sometimes the *beam* is loaded with a stone, to give it more solidity.

The cuttings and fleshings that fall at the foot of the *beam*, serve to wipe the black of the leather, after which they are burnt.

Those skins which require perching, are pared on the edges with the perching knife, which we shall describe hereafter ; these are all the operations performed by the *beam* and *knives*.

For calves and sheep skins, intended to be put in tallow or in red, they use the pumice-stone, after they have been passed over with the knives ; this takes off the fine flesh, without prejudice to the skin.

Of working with the Paumelle, or graining board.

This is a general operation on all skins to be curried, without exception.

The *graining board* is a square tool, made of hard wood, such as the cornil tree, or the wild apple or pear ; it is about a foot long, and five inches broad. The largest are two inches thick in the middle, and one inch at the extremities ; the finest are but one inch thick in the middle, and in proportion at the extremities. The upper part flat and even ; but the under part is convex or arched, so that the middle is thicker than the two ends ; this is furrowed across its breadth, that is, covered with strait and parallel chamferings, or hollow furrows, whose intermediate

diate edges are sharp like the worm of a hand coffee mill.

In the large boards these furrows are one sixth of an inch in depth, and one fourth in breadth ; on the upper surface a slip of leather is nailed crossing its breadth ; to receive the hand like that of a horse-brush, the workman extends the flat of his hand on the board, to pass it strongly on the skin, to temper, gather, turn up, and form the grain ; for it is principally this board that gives that agreeable grain, so much esteemed in leather.

They have *graining boards* of different sizes, whose furrows are more or less deep, according to the quality of the skins ; there are also *graining boards* made of cork to soften the skin ; to raise the grain and to lay the flesh, because those of wood mark too strong with their teeth. The largest, which are used for harness and sleek leather, the hardest operations belonging to the currier, have only about forty teeth in the length of a foot ; the finest, for finishing goat skins, have about one hundred. The middling are used for grained cows.

To work with this graining board, the skin is doubled grain to grain, and extended on a table ; the implement is advanced on the flesh, and drawn back strongly, by bringing back the quarter which rubs unequally on the middle of the skin ; it is this unequal rubbing which gives it the suppleness and grain, repeating the same successively on the three other corners of the skin ; this is called *tempering* the four corners.

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When the *board* is passed on the grain, which is called *turning up*, the grain is laid down, and the skin becomes sleek, soft, and equal; for the grain being wrinkled by the folds made in the leather, the board presses these wrinkles; they ingrain in the teeth of the board, and by that means become more formed and more durable. They perform this operation from tail to head and across these *cows*, which are to be put in black; the calves are turned up from tail to head, and are frized across only. To shorten the work, they wet (before putting in black) the black cows and goat skins, and they are tempered at the four quarters when they are in black.

We must observe, that *cows* in tallow must be boarded or grained across with the instrument; for this purpose the skin is extended on a table, having the tail part and most of the skin hanging before the workman, who doubles this hanging part upon that which is on the table, and pressing strongly on this fold, he brings it towards him with the *pau-melle*, thus to form the grain, and this is called *frizing* across. They do not pass over the quarters, till they have *frized* across; by this method the grain crosses and rounds itself, instead of being formed in strait lines, which would otherways happen if it was always worked in one direction.

Of Sleeking Skins.

The work of the *sleeker* is also common to all parts of curriery: the *sleeker* is a flat plate of iron or copper, of one fourth, or of one third
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of an inch thick at the top, that is, in that part which serves in lieu of a handle, and terminating by a kind of blunt edge; this instrument is of different sizes, from five or six inches to a foot; the cutting part forms an arch of a circle, the handle is a great deal narrower; and the whole resembles the head of a carpenter's axe, but not so broad at top or so sharp on the edge. Those made of copper are used for stretched cow-leather, for red cows, skins made after the *English* manner, and generally for all skins where there is danger of blackening the grain, because iron, unless great caution be used, blackens the skins.

The workman that *extends*, holds his tool almost perpendicular on the leather, and with both his hands rakes with force those parts which are too thick; those in which tan or flesh remain, those in which there are hollows and cavities; working the thickest parts towards the thinnest; in short, he makes the skin more dense, more compact, and more equal. That the instrument should not hurt the hand, it is sometimes surrounded with a slip of leather for the hand to rest on.

The *sleeker* serves to extend the skin, and beat down the grain; it forms the principal part of the work of cow-leather extended; of which I shall speak more particularly. Calve skins in oil, and goat skins, are not worked with the *sleeker*, as they require only to be fleshed.

Manner of Perching with the Perching-knife.

Perching, is a particular work belonging to curriery, which I shall here describe. The *perching-*

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ing knife is a circular knife, cutting in its whole circumference ; it is 10 or 12 inches in diameter, with a round opening of four or five inches diameter in the centre to pass the hand. The *perching-knife* is concave, like a bowl or leather cap ; the back or convex part is applied on the skin ; its edge is not very sharp, but must be a little beat down towards the workman, or the side opposite to the skin ; the edge is taken down by means of a butcher's steel, that it may not penetrate too deep into the skin ; this knife costs six or eight *livres*.

Previous to the perchings of a skin, it must be pared round the edges ; this helps the perching-knife, and renders the operation much easier to the *percher*. To pare the edges, the skin is extended on the *beam*, and a layer of two inches broad is taken off round the edges of the skin.

All skins in oil, which come under the perching-knife, must first be pared on the edges ; however this might be done with the perching-knife, but the work would be more tedious ; for all the edges of the skin must be perched on the hand.

To *perch* a skin, it must be extended on a stick supported horizontally at five feet from the ground, and this is called the *perching-stick* ; along this perching-stick a thick rope is extended, on which the skin is suspended lengthways with the grain on the inside ; and passing the skin under the perching-stick, they bring it back over the cord, so that it surrounds the perching-stick : thus the skin presses the cord against the stick, and the edge of the skin being seized between the one and the other, the hold becomes the stronger, the more they lean on the skin with the perching-knife.

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■ The skin thus extended on the stick, the *Percher* seizes the lower part with a pair of *pincers* and a running loop, something like a smith's tongs; this pincer hangs by a cord from his waist, taking his perching knife with both hands, he leans the convex part on the skin, and bringing it back from top to bottom, he takes off the fleshy and gross parts of the skin, this is called *perching*; they generally perch from tail to head, sometimes across: this is the most difficult operation of a currier.

It requires about one hour for a cow skin, but they can perch six or eight dozen of goat skins in a day; all skins prepared in oil are perched, whether cows, calves, goats, or sheep skins.

The *perching* knife must be passed from time to time on an oil-stone, and its edge taken down with the blade of a knife; that it may not enter the skin too quick and too sudden.

After having laid down the general operations of the currier, I shall pass to the detail of the different kinds of preparations, beginning by the most simple: I must first observe, that sometimes cow skins are worked whole, at other times they are cut into two; sometimes they cut the point and the belly to make the skins square, of these offals and the tail pieces they make harness, &c. the other cuttings which are thinner, such as the point (or head) and the bellies, are sold to shoe-makers for inward soal.

Of Leathers that are drawn out.

Leather drawn out is the leather of small calf or of cow hide tanned, worked with the graining board and hardened with the *sleeker*, to make thin soals; calve skins thus sleeked serve to make belts.

Extending or stretching of leather is the most simple part of the curriers business, its design being to make it firm and sleek, so that it stands in no need of oil or tallow.

When leather has been tanned after the *Danish* manner, the currier wets it, fleshes it on the *beam*, wets it again, passes the iron *sleeker* on it; dries it a second time, passes it over again with the *sleeker*, and when it is quite dry, polishes it over with a glass ball; this makes what is called *belt leather*. I shall here lay down the working of this leather as practised at *Paris*.

To *sleek* or extend a cow hide as it comes from the tannery, they take off the head which is too thick; they cut the hide into two, to work each half separately, they plunge it into a tub to wet it a little, and take it out immediately to work it whilst moist.

They first turn it up with the graining board to smooth it, to take out the chinks, to open and prepare it for the *sleeker*. In order to pass the *pau-melle* or graining board on the grain, they extend it on a strong oaken table, on which it is fastened by an iron instrument, the *paumelle* is worked on the grain from tail to head and cross-ways, for about three quarters of an hour.

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It is fleshed on the *beam*, after which it is worked with the *paumelle* on the grain a second time, from tail to head, and cross-ways, with greater strength than at first, because the flesh being taken off, the skin yields better to the *paumelle*; they wet it on the flesh side with a rag soaked in water, that it may the better stick on the table, and that the flesh may be well laid; they *extend* it on the table, and work it with the *sleeker* on the *grain* side, pressing as hard as possible with both hands, which smooths the skin and makes it equal, by driving the thicker parts towards the thinnest. This operation lasts half an hour, beginning towards the middle, and driving the *sleeker* towards the tail, then towards the head, sometimes obliquely and across. Care must be taken not to wet it too much, nor to expose it to the wind, it hollows the skin, and makes it soft.

It is *extended* in the air, and when there is scarcely any water remaining it is *retained*, that is, the grain is passed over again with the *sleeker*, being first wetted a little on the grain side with a swab soaked in water, giving more water to the parts which are most dry; that is, as the skin has more solidity in the heart, and the edges are the first dry, these parts must be wetted when the *sleeker* is passed over; when sleeked, a wetted rag is passed over the grain, which must be well wiped, for the beauty of the work is neatness. They are then dried in the air for seven or eight hours in summer, and put into press for three hours, and out again in the air; and when they are almost dry, if they still are warped or crooked, they must again be put into press, and they are finished.

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This leather is used for the soles of pumps, for inward soles, for the quarters of saddles, and other different works of saddlers and harness-makers; this kind of leather is not blackened, but preserves its natural fallow colour of tanned leather.

One man cannot finish more than four of these skins in a day, and if of strong leather but two, or if made of strong ox hide perhaps not more than one.

Of Sleek Leather.

A strong cow, or ox hide, passed in tallow and blackened, whose grain has been beaten down with the sleeker (and which is stronger than the black cow leather, or cow in tallow, of which I shall speak hereafter) is called sleeked leather; it preserves its strength like the former cow leather, but it is softer and less stubborn on account of the tallow with which it is penetrated.

Sleeked leather is generally made of the strongest skins fit for harness-makers use, which requires great strength, whereas the grain leather or cow in tallow, of which I shall speak hereafter, is used to make straps, belts, and such like; the grain has a pleasing aspect, and is always used in works that do not require strength, so that the curriers make more cows in grain than sleeked leather.

The *grained* and *sleeked* cow leather are both put into tallow and into black; the difference of working between a cow put into tallow, which is to

to receive the *grain* and that which is to be *flecked*, consists in giving strength to the latter, whilst *grained* leather requires suppleness only.

To make this a tanned and dried hide, is to cut it into two, and the head taken off, it is wetted or damped in a tub, and trodden; care must be taken not to wet it too much.

It must be well treaded, so that there remains no hollows, for nothing is more unpleasing than flecked leather that has hollows when finished; the paumelle or graining board is then passed on the *grain* side, and it is fleshed lightly with the cutting knife. It is hung out in the air, trod again half wet, exposed again to the air, trod again; the paumelle passed on the grain side, put out again into the air, and left there till it is dry at heart to receive the tallow.

To tallow a hide, take common beef or mutton tallow, either is indifferent as to the goodness of the leather. Sheeps tallow affords a better lustre to the skin, but being dearer it is seldom used; at *Paris* they buy brown tallow, extracted from the greaves, after the white tallow has been drawn off for candles. This brown tallow costs about six or eight sols a pound; they have also tallow brought from *Muscovy*. It generally requires five or six pounds of tallow to a flecked hide, more or less, according to its strength; the flecked leather being stronger than the cows in black, consequently require more tallow.

Before a skin is put into tallow it must be singed, that is, passed lightly over a clear straw fire, to make the tallow penetrate the better; but
flecked

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Peeked cow skins are not to be singed on the *grain*, because the fire would close the grain too much, and render them more difficult to be taken down, therefore these are singed only on the flesh side. The skin is then taken near the boiler, where the tallow is melted, and extended on a table. The tallow must be heated to that pitch, that a drop of water dropped into the boiler may evaporate; without this the tallow would congeal on the skin, and would not penetrate, yet it must not be so hot as to burn the skin.

To lay on the tallow, they use a woollen swab fifteen or eighteen inches in length; it is bound together, so as to make a handle of the length of ten inches or a foot, six inches remaining forms the tuft or mop of the swab. The tallow is laid on the *grain* and *flesh*, but more on the flesh side, on which the tallow is first smeared, because that is the most open and porous: care must be taken that the edges and groin be well fed, these being the most stubborn parts; a skin loses a great deal of its beauty when the extremities are badly fed; it requires about five minutes to tallow one *band*, that is, half of a cow hide of a middling size.

After the tallow is laid on the skin, it is folded square, the grain side inward; it is left to soak in a vessel for a night, or for eight or ten hours. The next day the water is pressed out, by the foot and pin-block, till such time that all water is expressed. Only one band, or half a hide, is to be trod at once, for if two were trod together, one would have time to stiffen and dry.

The flesh side is grained or frized with a *paumelle* which has pretty large teeth ; this *frizing* only serves to cleanse and scour the grain ; the *paumelle* is then passed on the grain from tail to head, and cross ways until the grain be almost beat down ; care must be taken to pass the *paumelle* well on the borders that the skin may lay the closer on the table.

The skin is then extended, the flesh side on the table, by strength of arms, it must be well beat down, and smoothed with the *fleeker*, and this is what is called fleeked leather. The grain is wiped with the fleshings, to take off the fat, and it is blackened immediately, without taking it off the table.

To compose the black, fill a tun with old pieces of rusty iron, pour on it four beer sufficient to cover the iron, let this beer work on the iron for three months, and draw off the liquor, which appears a little reddish, but will perfectly blacken the skin. Dip a woollen rag, or brush made of horse-hair, into this liquor, with which smear or rub the skin on the grain side, and it will immediately turn to a fine black.

At *Paris* they use the *Hatters black* composed of gum, logwood, copperas, and gauls ; it hardens the skin more than the black of beer, but it costs less ; they add one pound of copperas to each pail of black : I shall hereafter shew different methods of composing the curriers *black*, with four wine, with the water of the vat, and with four leaven steeped in damaged beer.

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The first black is given on the table after the leather has been drawn out with the *sleeker*; but black cow leather must be hung in the air to dry, before it is blackened.

Having given the first black, it is hung out in the air, there left till it is three parts dry, then passed over with the *sleeker* on the grain side, gently, for fear of fraying the grain; the *sleeker* must always be pushed forwards, and not inclined on one side more than on the other, for that will give shades to the leather, instead of its having a regular and uniform look.

The edge is formed, by cutting the back of the band with a knife, and rubbing it with its edge to make it appear thicker, and then it is blackened; they gave a second black to the *sleeked* leather, after the same manner as the former, exposing it again to the air; and when it is almost dry, (retaining yet some little moisture in the middle) it is a second time passed over with the *sleeker*, after the same manner as before; it must be well laid down, that is, very smooth, without any mark, or stroke of the *sleeker*.

When it is dry, they sometimes give it a third black, if any red places appear, which have not rightly taken the black; but this is seldom necessary.

The *sleek* leather being dry, is put at several times into a press to be dressed; it may be left a week or a fortnight in press, when it is nearly dry; before it is thoroughly dry, it pushes out its tallow, but this only serves to harden it.

To finish the *fleck* leather, wipe off the tallow and mould that may have gathered on the grain, lustre it with four beer, and pass the flecker over it, repairing and amending such spots as the flecker may have missed in the former operations. When this is done, hang it in the air to dry out the beer; one hour is sufficient for this, but the sun is to be avoided.

The leather is brightened with the juice of wild barberries, which grow in the hedges in *France* in clusters, and are ripe in autumn; the juice is expressed like that of the grape, and is kept in vessels to brighten the leather. I shall in the sequel shew other lustres.

If it should be found that in any part of the leather the grain should be worn off, or spotted with fat, it must be again lustred, by rubbing lightly the defective parts with a piece of woollen stuff wetted in the lustre, until they become as bright as the rest of the leather.

A fleck hide of a middling size is worth 15 *livres* the side, that is, 30 *livres* the entire hide.

Of Cow leather in Tallow, with the Grain.

Cow leathers in black, or *cow leathers in tallow*, with the grain, are those on which the grain is raised, instead of beating it down as in the *fleck* leather, which has been already described: they are more supple and soft than *fleck* leather, yet they have more substance than cow hides in oil, they

they are also less liable to be spongy, that is, to be penetrated by water, than the oiled cow leather.

Cow hides in *tallow* and *grained* are chiefly for the saddlers, harness makers, and trunk-makers use; they are chiefly appropriated to harnesses and coaches, and serve for the most neat and ornamental parts. For the tops of coaches they chuse the largest and soundest, and they work them whole, without cutting them in two; a fine pavilion or imperial of a coach, when well grained and without defect, is the master-piece of a currier.

To put a cow-hide in tallow, take the hide whole as coming from the tanner, tread it, to open and soften the skin; it must be trod till no cavities remain; then fleshed, rendered equal and uniform with the cutting-knife, and care must be taken that the knife does not streak it, that is, that the edge may be soft and smooth. It is hung out in the air, when half dry, and trod again; this second treading half wet is called *retaining*: this operation opens the skin and prepares it to receive the tallow; it is then again trod until there remains no cavity or impression of tan.

The skin is again hung in the air; and when almost dry, it is trod a third time, after which they roll it to take off the folds; if it is too hard, it is sprinkled with a broom, that it may the easier be trod. It is passed on the grain with a *pau-melle* made of cork from tail to head, which smooths it, and causes the tallow to extend more equally.

When it is well trod, it is hung in the air, but taken in before dry at heart to be tallowed. This moisture prevents the tallow from seizing and hardening the skin; it would be even good to sprinkle the skin on the flesh and grain side before it receives the tallow, otherwise the hot tallow might burn it.

To make *black cow skins*, the tallow is applied after the same manner as for *sleek leather*, except here both grain and flesh must be singed, whereas *sleek leather* must not be singed on the grain.

The quantity of tallow required is in proportion to the strength of the skin, from three to four pounds for a common cow, more or less, according to its weight. A calf-skin, weighing two pounds when dry, takes about half a pound of tallow; one of three pounds takes one pound of tallow.

After the tallow has been applied once on the skin, it is rolled, and folded the grain inwards, that the tallow may penetrate in every part; it is thus left some hours; it would be the better to remain so some days, as the tallow would have greater effect. It is folded square, put to soak eight or ten hours in a large vessel filled with water, as mentioned for *sleek leather*.

It is trod whilst wet, and soaked two or three times in the water, until the grain appears white, without any of the filth of the tallow; yet it must not be too much soaked, for that would discharge it too quick, and cause the feeding to come out.

It is *frized* with the *paumelle*, the grain uppermost; to open the grain and cut the veins, the *paumelle* is passed, the grain on the table, to cleanse the flesh and open the skin, which makes it stick and extend better on the table; before it is laid on the table, it must be well wiped both on the flesh and grain side with a hair broom; this takes off the filth that the *frizing* and *paumelling* have raised on the skin: the table must also be well cleaned; after which the skin is extended on the grain with the *sleeker*: great care must be taken to leave no drills or folds in the turning of the groins; the *sleeker* must not have too much edge, lest it should damage the grain.

After the skin has been extended by the instrument, they give it a light touch of water, and wipe it with the fleshings, to take off the remaining dirt. They then double the skin (for the grained cow leather in tallow is worked whole, and not cut in two;) they then are hung in the air; if the air has seized the edges, which are apt to dry too fast, they must be wetted with a swab, without which they would not take the black.

Before the black is given to the skin, it is a second time extended slightly by the *sleeker*, by way of another dressing; for in drying it rumples and becomes unequal: after being *extended*, it is prepared to receive the black.

To lay on the black, the skin must be in a proper state, that the black may penetrate equally; it would not be so beautiful if applied to a skin
I 3 thoroughly

thoroughly dried. They use the *batters black*, or the *black of iron*, as for sleek leather; as soon as they have given the black, the skin is put out to air until it be more than half dry, it is then blackened again; when it has sucked up its black, it is passed over with the *fleeker* on the grain, and made as smooth as possible; to make them imbibe their first black, as fast as they are blackened, they are folded with the grain inwards, and if they are several, they are piled the one on the other; when they are passed over with the *fleeker*, they receive their third black, are hung in the air, and there left to dry thoroughly. When dry they are smeared with beer, then folded from corner to corner, and the *paumelle* drawn over them, the *paumelle* is then passed across on the grain; the grain is then wiped with a piece of old blanket to scour it, and another smearing of beer finishes the scouring of the grain.

When the skin is thus scoured it receives a form with the *fleeker*, is wiped with a woollen rag, and is lustered with juice of barberries to brighten the grain. It would be proper to leave the skin one hour or two in this state, to harden, but this is not commonly practised.

This done, a finer *paumelle* than that before used is passed obliquely from the paitte to the throat, then directly across, so again from tail to head, rounding the grain as much as possible; care must be taken to manage the groins in passing from quarter to quarter, as well as rounding, because these parts are more feeble, and would become too flimsy.

A second scouring with four beer is given to dry and harden the grain; it is then hung in the air for one hour or two, until the grain be dry; lastly, the juice of barberries is applied to brighten again, and this is the last operation. It requires twelve days for one man to finish one dozen of black cow skins.

To polish, they use a piece of bolting cloth, plush, or some such smooth stuff, for the grain being soft, is liable to be scratched; the polishing must be done gently: but I shall treat more at large on this subject, when I come to the preparation of goat-skins. Instead of the black, which is a tinct of beer, they sometimes use low brandy, wine that is pricked, sumac, or water of the vat.

On pressing occasions, a leaven may be made with barley flour, which must be steeped twenty-four hours in beer; as much copperas must be boiled in two or three quarts of vinegar, in proportion of five pounds to a hoghead, which being poured on the beer, a black is immediately prepared; but this is apt to grease the grain.

In defect of barberry juice, they use a lustre made with four beer, gum arabic, and sugar; it may be made also by putting syrup of sugar or molosses into beer. One pound of molosses will make fifteen quarts of lustre, and is sufficient for ten dozen of cow skins.

Another kind is made of the gum of our common trees; but the juice of barberries is the best of all lustres, and is not dear, a quart costing but 12 or 14 *sols*.

The black grained cow skins above-mentioned are used by coach-makers, saddlers, harness-makers, and trunk-makers. When a very large one is found without defect, it is reserved for the crown of a coach.

Of Cow skins in Oil.

Few cow skins are now finished in oil, because the shoe-makers of *Paris* generally use turned calf, that is, calf passed in oil, with the grain outward, and the harness-makers prefer the *steek* leather; it is certain that cow skins in oil do not last so long, but are more elegant and neat; and as cabrioles, and other small elegant carriages, do not require great strength, some coach-makers begin to use them; they cost near the same as cow skins in tallow.

Shoe-makers often prefer oiled leather for upper leathers, on account of its being softer and lighter than tallowed leather; but they are easier penetrated by wet.

Skins to be dressed in oil must be well tanned, and more substantial than those dressed in tallow. The first operation is the treading, as for *steek* leather; then they are distinguished by the currier into those intended for black, and those for white.

And

And indeed the oiled leathers are of two kinds, the one for the shoe-makers use, and the other for the sadlers. Those which the shoe-makers use are not blackened, because they perform that on the flesh side with their wax, which is composed of mutton suet and lamp black; I shall speak of it separately under the name of *white cow leather in oil*, and shall here only treat of black oiled cow leather for the use of harness-makers. The black oiled leathers are never *sleek*, being put in grain as the tallowed hides.

The oiled leathers intended for sadlers, that is, those that are to be blackened on the grain side, require only to be lightly fleshed, as the perching knife does the remainder in the sequel of the operation; otherwise they are begun like the tallowed hides, they are trod, lightly fleshed when intended to be worked with the perching-knife, but more fleshed when that is to be omitted: they are trod with water, and in treading them care is to be taken to soften them well by wetting them in a vessel several times with water, and treading them each time; they do this sometimes seven or eight times.

They are *extended* or *stretched* with a copper *sleeker*, and hung in the air, as they would be too wet to be put in oil; one hour is sufficient in summer, yet some will not expose them to the open air, lest it should seize them too suddenly; when they are of a proper degree of dryness they are put into oil.

For this purpose the curriers have for these sixty years past used the *dubbings* of the chamois leather-

leather-dressers, which is a mixture of fish oil and pot-ash, used in scouring the skins which are made into *chamois*. These *dubbings* are thicker than oil, and feed the skin better; it makes it softer, because it is of a saponaceous or soapy quality, and agrees very well with the skin. At *Paris* most of the *dubbing* comes from *Niort*, *Strasbourg*, *Grenoble*, &c. Formerly they used fish oil, but it did not make the skin so mellow; the *dubbing* feeds the skin better, that is, gives it a greater body, and unites with it better than fish oil alone; but when the *dubbing* is thick, it carries more oil, and gives a greater substance to the leather; when it has not been well boiled and is watery, the skin suffers thereby, because it penetrates badly.

Mr. *Blondeau*, physician at *Chauxneuve* in *Franche Comté*, extracted the oil of the offals of bullocks, sheep, goats, &c. and found it gave the skins a very good quality; the following is his process.

The offals being boiled in water, the oil and all the fat is taken off, and slung into another boiler nearly filled with hot water ready to boil; this second boiler is kept in the same degree of heat for twenty-four hours, and sometimes longer; the purest oil swimming on the surface, is drawn off by a cock adapted to the boiler, and poured into a third boiler, where there is a sufficiency of hot water to prevent the fat mixed with the oil from congealing; the water of this boiler is kept in the same degree of heat for twenty-four hours, and then left to cool.

The fat, which always keeps at bottom, entirely coagulates, and he draws off three kinds of oil, by three cocks, fixed the one above the other; the heaviest

heaviest oil drawn off by the third cock or lowermost, being applied on leather, renders it impenetrable to water, although it should remain several days on the leather.

They make oil from offals at *Paris*, which might serve for this purpose, if on experience it be found good and cheap.

The common *dubbing* cannot be used without oil; some curriers mix together one quarter oil and three quarters of *dubbing*; others put equal parts, especially when the *dubbing* is thick. In the first feeding they put more oil than in the second; when they have meagre and stubborn skins, that have had too much lime, and will soak water, they use less oil, because it penetrates too much, and the quantity of *dubbing* is augmented.

Dubbing is so dear at *Paris*, sometimes in war, the curriers will not buy it; it has rose from thirty *livres* the quintal to seventy *livres*; whereas the oil never exceeded fifty five *livres* a quintal.

If the *dubbing* is too thick, more oil is added; if it is a good *dubbing* it will take half oil; more *dubbing* is to be laid on the head and tail parts of cow skins than on the bellies; on the contrary, calve skins require more on the belly. Some curriers warm it, particularly in winter, but this is not a general rule.

A cow skin generally imbibes one-fourth of its weight of *dubbing*, that is, a skin of fifteen or sixteen pounds requires four pounds of *dubbing*; calves require more in proportion to their weight;

one dozen of calve skins, weighing twenty-eight pounds, take about ten pounds of oil and dubbing.

The skins must still be so moist, that water may be expressed from them when they receive the oil or dubbing, that the oil may penetrate little by little as the skin dries; for this reason they wet the parts that are too dry, to restore the necessary moisture, the oil not giving a sufficient body to the skin, not penetrating and nourishing it sufficiently when it finds the parts too dry. Nevertheless the dubbing must not be mixed with water, for that would prevent the dubbing from penetrating into the skin.

When the oil has been laid on the flesh and grain with the swab and the hand, they hang the skins by the hind pattes, and let them soak their oil according to the wind or season; when there is a brisk wind they require but one or two days to dry, at some seasons they require a month; the sun and too hot weather are dangerous, for then the oil has not sufficient time to dilute, soak, penetrate, and unite with the skin.

Some use oil and dubbing on the flesh, and oil alone on the grain, others put oil and dubbing on the grain and flesh, and others put dubbing on the grain, but somewhat less than on the flesh, as the dubbing prevents the grain from brightening.

Skins for fadlers are not fed so much as those intended for shee-makers, the former requiring one third less.

When

When the skins are dry they are softened by treading, then they give them more oil than dubbing; they tread them a second, after which, to scour the grain thoroughly, they rub the skin with a brush dipt in a weak lye of pot-ash, and immediately after they give them the black, observing to keep the edges clean. The black is the same as for sleeked leather, and is laid on in the same manner, with a brush or a handful of woollen stuff.

After giving the first black they are *frized* across, then they receive a second black, which is generally sufficient, and are put in the air to dry thoroughly. When dried they are trod, the *pau-melle* passed over them on the flesh side, and fleshed on the edges, then with the perching knife, after which they are rubbed over with a *cork pau-melle*; and lastly oil is laid on the grain, and they are finished.

A workman may finish one dozen of cow skins in oil in twelve days; they are commonly worth eighteen or twenty *livres* each; they serve chiefly for cabrioles and light work, as they are greatly brought down, that is, are very thin.

They make the backs in oil for harness-makers, both of ox and cow skins after the heads and bellies are cut off, leaving the back three feet and a half broad, and four feet and a half long; this is the strongest part of the hide, and used for harness work.

Of Waxed Cow Leather.

Waxed cow leather is now very scarce; formerly they rubbed certain skins with melted wax, sufficiently hot to penetrate the skin; but wax being five or six times dearer than tallow, renders the skins extremely costly, and they are never thus prepared but on certain occasions where harness-makers require them for works of great nicety; yet cow leather in tallow, when worked with great care and firmness, passes under the name of *waxed leather*.

However, some are prepared with a fourth or an eighth of wax mixed with the tallow, to give a greater firmness; but they also sell the *fleecked leather* before described, under the name of *waxed leather*.

Of English Cow Leather.

Hides called *English cow leather*, or *leather after the English fashion in oil or tallow*, are hides of cows or oxen in *fleeck* or in *grain*, and in which the natural yellow colour of the tan is preserved, notwithstanding they are tallowed.

To make this kind of leather, chuse a clean skin, white in the grain, and of a good quality, well tanned, and not in the least green; tread it with the pin-block and feet, as those which are to be *fleecked*.

This work must be conducted with the greatest neatness, for the least spot would spoil it for the use intended. It is hung in the air, trod with the feet, and fleshed.

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When it is almost dry it is passed over with the *flecker*, then folded grain to grain, and the *paumelle* drawn over it, after which the *paumelle* is passed on the grain to take out the folds; when it is thoroughly dry, and before the tallow is laid on, it is wetted on the grain with a swab dipped in very clean water, that the scores of the knife or the more feeble parts may not be pierced by the tallow.

The tallow is laid on the flesh side, but it must not be so hot as for the *cow in tallow*, or for *fleck leather*; very little suffices, lest it should penetrate to the grain, the colour and neatness of which are to be preserved; after receiving the tallow it is soaked in a vessel of very clear water for half an hour.

It is trod wet, extended, and a light layer of linseed oil laid on the grain; they sometimes use fish oil, but linseed oil is preferable; it is spread with a swab of clean wool, and then put to dry. It is finished like flecked leather, with a copper flecker instead of an iron one, which is apt to spot and blacken the skin.

When it is thoroughly dry, make a colour with *grains of Avignon* or with *saffron*; some put no colour, and only smooth the skin. To colour six hides, about half a dram of saffron is sufficient, steeped in a quart of beer; this colouring must be extended very quick and very equally, or the skin will be spotted.

It is exposed again to the air, and wiped with a piece of woollen cloth, or a white towel, which brightens

brightens and gives it a lustre; it must not be put in the sun, for that would make the oil penetrate to the grain, and spot the skin; for the same reason barberry juice is also omitted, it is sufficiently polished by wiping till it is dry.

These *English* cow leathers are also used for harness, and cost one-fourth more than *tallowed leather*.

Of Grey Cow Leather.

The *grey cow leather*, called also *fat cow*, are different from the cow leather of *England*, in that they require neither the neatness nor colour of those before-mentioned. They give them as much tallow as they can bear, and have no regard but to the suppleness. These are prepared like the black cow leather, as far as the laying in of the tallow; they are exposed to the wind after receiving the tallow; and to make them still more soft, it is necessary to give them a layer of tallow and of *dubbing* on the flesh and grain side, when they are half dry; one pound and a half of oil and *dubbing* is sufficient for each skin. These serve for portmanteaus, bellows, pumps, and other works which only want strength and suppleness.

Of White Cow Leather in Oil for Shoes.

The *white cow leather oiled* is made into shoes; this does not require to be exposed to the wind, as the leather made after the *English* manner, because that is only to give it neatness; it is trod, and lightly fleshed, because it is to be passed over with the perching-knife at the end of the operation;

tion ; it is put in oil and dubbing on the flesh and on the grain side ; it requires about three pounds of nourishment for each skin, for they must be well fed. They dry it, tread it, flesh it on the sides, perch it, and draw the *paumelle* over the grain, to take off the wrinkles, and afterwards pass the cork *paumelle* over it, to lay the flesh and heighten the grain. It is used by shoe-makers for shoes with the grain on the inside, and blackened on the flesh side.

Of Calve Skins.

Calve skins are generally worked like cow skins, and are employed to the same uses ; they make *tallowed calf leather*, *calf leather after the English manner*, and *calf leather after the Russian manner* : the work is the same with that of cow skins, but as they are not so strong, they manage them more sparingly, and give them less nourishment ; the common preparation of calves, is that of calf in oil.

To make *oiled calve skins*, take the best skins, or those that have the grain entire. The currier receives them just as they come out of the pit ; he airs them, fleshes them slightly, and treads them for a few minutes, after which cold oil is laid both on the grain and flesh side ; some heat the oil in winter, but this not a general practice.

Calve skins of thirty and thirty-six pounds to the dozen, take twelve or fifteen pounds of dubbing, each skin in general requires one pound of oil and one of dubbing.

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Those which have had too much of the lime pit, take less nourishment than those which have been well tanned, because, becoming dry and thin by the effect of the lime, they cannot imbibe the same quantity. Excess of oil or dubbing is also to be avoided, as it makes the skins too supple and flabby.

Calves being put into oil are dried and cleansed; this operation consists in treading them, to soften them and take off the tan and foreign matter that stuck to them; this softens the skin and raises the grain.

Before they receive the black, they use pot-ash, to scour, soften, and prepare the grain to take the black. For this purpose, they dissolve one pound of pot-ash in a pail full of water, with which they are brushed.

When scoured, the black is immediately applied, which is the same as for cows; if too much is applied, it will pierce the skin. After blackening, they are *frized*; but for those which are strong in the neck, it is necessary to pass over the grain with a larger *paumelle*, than that used for *frizing*: they are *frized* across which cuts the veins of the skin, and prevents those long furrows which are often seen in different directions; they then give a second black to the skin, and hang it in the air to dry thoroughly. They then tread it, to soften and cut the nerves, to make the grain come out, and to open the grain; this is what is principally regarded in *oiled calves*.

They

They are laid on the table folded grain to grain; the paumelle is passed on the flesh side, and then on the grain, to soften the skin, and to take out the wrinkles of the treading. They are fleshed on the edges with the *reversed knife*, all round the skin, to facilitate the fleshing, which is afterwards to be done with the *perching knife*.

Where the reverse knife cannot be procured, it might be done with the perching knife, which does not so much impoverish the skins as the other knife, but requires more time; it may be pared round the edges by the hand; they perch six or eight in one hour. When they are perched, the *cork paumelle* is passed on the grain side with a little oil on the grain to deepen the black, whose tinct has been weakened by the working; this is always done with fish oil.

These black calves are sold from thirty-two to thirty-six *shillings* a pound; one dozen may weigh from twenty-two to four-score pounds: the lighter they are, the dearer they are sold by weight, because there is more trouble in one dozen of thirty pounds, than in half a dozen of the same weight.

To work calves in tallow, take them dry from the tanners, sprinkle them with water, and lightly pass them over with the blunt knife.

The heads being the thickest parts are *taken down* quite to the throat, that is, they are pared with the reverse edged knife, being first moistened with

with water, that the knife may work better on the skin. The heads being dried, the skins are pounced on the flesh side with a *pumice stone*, to take off the inequalities of the flesh. They are then doubled grain to grain, and a fine *paumelle* passed on the flesh side, and the cork *paumelle* passed on the grain; but before these two operations a light watering must be given on the grain to soften it. When dry, they are put into tallow like cows; calve skins weighing thirty-eight or forty pounds to the dozen require about twelve or fifteen pounds of tallow. After tallowing, they are aired and finished like black cow skins; they are trod with the water in, are frized, scoured, put in black twice, folded grain to grain, the *paumelle* passed on the flesh side, then on the grain, again on the flesh, and then lusted or polished.

Tallowed calves are used by saddlers, harness-makers, trunk-makers, and also upholders for chairs and tables, tho' the last more commonly use *Morocco leather*. A calf skin in tallow is worth about five *livres*.

The *English* calf is made like the *English* cow leather, choosing those of the best quality.

The first operations, till the receiving of the tallow, are the same as for calves in tallow; the tallow is laid sparingly on the flesh side, lest it should spot the skin.

Strong calves are passed in white; they serve for the upper leathers of coarse shoes, the same as the white cow oiled leather.

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The first work of a white calf skin is the same with that of a black one; after oiling and cleansing, it is felled on the sides and perched from tail to head, then trod till it be thoroughly soft; two calves are trod at once, laying flesh to flesh to keep them neat; the *paumelle* or graining board is passed on the grain, they are worked across with the perching knife, because the flesh must be smooth, and this repairs the defects of the perching from tail to head. At length they are passed over with the *cork paumelle*, and this is the last work of white calves.

The shoe-makers distinguish the *turned calf* and the *black calf*. The turned calf is oiled, and the grain or hair side is turned uppermost, as hath been in practice these sixty or eighty years. The black calf is the white calf in oil, which the shoe-makers use for coarser shoes: the flesh side is out and the grain inwards; this does not appear so well to the eye, and the shoe-makers blacken it themselves.

Calve skins are sold by the pound, and not by the dozen, as goat skins; the smaller and finer they are, the more they will sell for; they weigh from two to eight pounds, when prepared, and often cost from thirty to thirty-two *shillings* the pound; the profits cannot be so considerable on calves, as on strong leather.

Calve skins being tender and delicate, it often happens that in taking the hair off, and in the river work, the grain is spoiled or scored by the knife, and

and torn; these skins serve for the grain inward, or for chamois.

There are small calves still-born called *sinks*, which are put into the vat, and afterwards into the tan-pit, for three or four months, without being at the trouble of taking the hair off; they are scoured like the others.

Of Goat Skins.

Goat skins require more working than calves, and more gentleness and management, because they are not in general so strong.

Those goat skins worked at *Paris* are chiefly brought from *Limousin*, *Auvergne*, *Franché Comté*, *Switzerland*, and *Provence*, where they are tanned with *redou*, a plant I have described in the former part of this treatise. Goat skins in this state are called by the curriers of *Paris* *marroquins in basil*. They steep them for twenty-four hours in a vessel, tread them three by three, and then drain them on the beam with a blunt knife, on the flesh side only; when they are almost dry, they are put into oil and *dubbing*. One dozen of goat skins, weighing eighteen or twenty pounds, require six or eight pounds of oil; being oiled, they are trod, worked with the *paumelle* more gently than calves, and cleansed by treading.

They scour the goat skins with a weak lye of pot-ash and a brush; a quarter of a hundred of pot-ash boiled in two pails of water, will scour six dozen of goat skins. The alkaline salt dissolves the superfluous oil, and takes off the filth which the oil had left on the grain of the skin; this brightens and

and softens the grain; they afterwards *frize* them from tail to head, and across the grain upwards, then *paumelle* on the flesh, and this gives the grain to the skin.

Before they receive the black they are laid on a table, and rubbed over with a reed called *Spar* or *Bas*, to soften the grain, which is naturally hard and rough. This plant is called by *Pliny Spartum*, the bales or matts which contain the *Barilla* from *Spain* are made with this plant; a handful of this rubbed on the skin extends, dresses, and softens it.

After *sparring* them they are smeared with black, put to dry, and a second black given them; this black is permitted to soak for some hours, after which they are brightened on the grain with beer or vinegar; they then give a second *sparring*, and hang them out in the air; when dry they are trod, doubled grain to grain, paumelled on the flesh side over the four quarters, and over the grain, wiped, and brightened, or lustered.

To lustre them, they must be first rubbed with a piece of listing dipt in the lustering-pot, sprinkled and rubbed over the whole surface; it is then rubbed again with spar with both hands strongly, in all directions, and for a considerable time, that the lustre may be heightened; in fine, the skin is cleared up by rubbing it with the same piece of listing used dry.

After they have received the lustre they are pared round the edges, and perched with the perching knife. There are some provinces where the

the skin is not pared, but worked with a pumice stone set on a haft like the *paumelle*, and they use also the pumice stone to cut the grain instead of the *paumelle*.

After perching, the *paumelle* is drawn over the flesh side from tail to head and across, to raise the grain, but very lightly, that it may not tarnish it; they are then wiped, and linseed oil applied to them, which deepens the black, and preserves its brightness. It must be observed, that if they fail in the first black, by neglecting to scour the skin well, or by any other carelessness, the skin will never be beautiful.

It is good work to blacken and cleanse eighteen or twenty goat skins a day, I mean the first black; for as to the second black, two dozen may be done in an hour.

Goats in oil weigh about eighteen pounds the dozen, and are sold by weight from three *livres* to three *livres* fifteen *sols* a pound. There are some that weigh forty pounds the dozen. There are even goat skins of six pounds each, but they are scarce, and are commonly the skins of buck goats.

Those which are to be tallowed, require no oil or *dubbing*; but they put none in tallow at *Paris*. The *marroquin* or *Spanish* leather of *Rouen* is only goat in tallow or in hogs-lard; and the curriers of *Paris* commonly call *marroquins* those goat skins in oil; these are their finest skins.

Of Sheep skins.

They sometimes put sheep skins in tallow, but more commonly in oil, though they are finer in tallow; yet these cost more, and take a longer time.

At *Paris* they make both white and black sheep leather: they generally chuse sheep skins that are low in the grain, or slightly ruffled, which they get from the country ready perched, or after the first work, and they are blackened by the curriers at *Paris*.

They also use sheep skins tanned, which they wet, flesh lightly, and extend: they are then sparingly oiled, both on the flesh and grain side: one pound of oil is sufficient for a dozen sheep skins, weighing eighteen pounds. When the oil is dry, the black is laid on; for which purpose they first use pot-ash to scour the skin; when that is done, they apply the common black; but it must be laid on sparingly, because oil not having so much body as tallow, the black would penetrate and make the flesh unsightly. To keep the flesh side clean is an attention to be paid by good workmen in all kinds of skins, for that is the ornament of the skin, and those that neglect it are slovens, and scarce deserve the name of curriers.

When the skin is blackened, it is doubled grain to grain, and a fine *paumelle* drawn on the flesh side from quarter to quarter, and from tail to head; this must be done whilst wet, for if the flesh was dry, the *paumelle* would not take, and the grain would not be equally formed; this done, it is

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hung

hung in the air, and when dry it receives the second black, then hung out, to dry thoroughly, after which they give the third black. If several dozens are worked at one time, only one skin at a time must be blackened, for they must be perched whilst the black moistens the flesh, for if the flesh was too dry, it would scale, appear rough, and be apt to tear.

Sheep skins are perched with *German* perching-knives, which are thinner, and not so heavy as those used at *Paris*; this perching-knife must not be set on the oil-stone, but only on a whet-stone, which gives it a dead edge; so that it is rather *scratching* than *perching*; when perched, they are put out to dry, oiled on the grain, to deepen the black, and brightened.

When intended for tallow they are lightly fleshed and rubbed with a pumice-stone; this done, the flesh side is sprinkled with water, the *cork paumelle* is drawn on the grain, it is put into tallow, and trod with the water in, so that it may become supple; after this treading, it is *frized*, extended, blackened, and hung out to air.

When it is half dry, it is passed over with the *iron flecker* on the flesh side, after which it receives a second black, then hung in the air till thoroughly dry, folded grain to grain, and the *paumelle* passed on the flesh side from quarter to quarter; a *cork paumelle* is then drawn over the grain from tail to head; the *paumelle* then run across the flesh from tail to head, on the borders, which gives a grace to the skin; a wash of beer is cast on the grain, which is wiped off when dry, and this brightens

brightens it, as before described ; a skin that has a fine black, and is very clear, fetches the highest price, therefore the currier ought not to neglect this part of the finishing : they must be dried in the shade, for the sun imbibes too much of their moisture, they should not be left too long in the air, lest they should grow hard.

The price of sheep skins worked by curriers cannot be fixed ; some cost but eight *livres* a dozen, whilst others bring 48 *livres*, in proportion to their size : they are never sold by weight, yet they are generally estimated at twenty *shillings* a pound.

Of Russia Leather.

Russia leather, sometimes corruptly called *Rouset leather*, is cow or calf leather dyed red, cylin-dred, hardened, and impregnated with an oil that is almost *empireumatical*, whose smell is extremely strong, but which renders the grain fit to resist water. The *Russia* leather is in great esteem with saddlers ; it is used for the inside of coaches, cartouche boxes for soldiers, and several other works that require neatness and elegance.

Cow hides are chiefly used for this work. They take a skin in the tan, the whitest, cleanest and most perfect ; it is soaked in water, lightly fleshed with a round knife on the beam ; the extremities and weak parts of the belly, which do not take the colour well, cut off ; it is fleshed on the beam, trod, worked with the *paumelle*, and smeared on the grain with clear fish oil, and oil with *dubbing* on the flesh ; when dry it is again worked with the *paumelle*.

A wash of alum-water is then laid on the grain, and whilst yet moist it is passed with a cylinder, (hereafter described) they then give it a second wash of alum water; when a little dried, they apply on the grain side an oil called *Russia oil*; the skin is then coloured red or black, and exposed to the heat of the sun, to make the colour penetrate; the colour is laid on at several times, and each time the skin is dried, until it is well coloured; it is then trod again, worked with the paumelle, fished to the quick on the beam, and also with the perching-knife; at length it is brightened by rubbing it on the grain with a very rough brush.

There are at *St. Germain* several tanneries, where they prepare strong hides by barley; but the most important is that which is near the hospital, and which is commonly called the *tannery of the Jews*. The chief part of the workmen are *Germans*, and the establishment itself was formed on the project of a *German* named *Teybert*, who about twenty years ago brought into *France* the secret of *Russia leather*, and the method of making *Walachian* and *Transylvanian* hides, already described.

This man pretended that *Russia leather* was the chief part of his secret; he said he had learnt the method of making it in *Muscovy*, at the risque of his life. The chief part of the secret it seems is in the *Russian oil*, which renders it very soft, prevents its being cracked and penetrated by rain so easily as other leather, and gives it a particular smell, which the workmen hold in great esteem.

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The machine with which they give that grain, or impression of a multitude of small lozenges to the *Russian* leather, consists in a steel cylinder of about one foot in length, and three inches diameter: this cylinder is cut with a multitude of small ridges very close together, like the threads of a screw, not spirally, but circular; it is loaded with a mass of stones weighing three or four hundred weight; it is run over in two directions, on a wooden bench, by means of a rope which passes over a wooden cylinder with a handle; the rope also passes over two cylinders or rollers fixed to the ceiling, and over a fourth roller at the extremity of the bench; the cylinder which has the handle has two separate parts, on which the two ends of the rope pass in a contrary direction; by this means one handle gives to the cylinder two motions, viz. forwards and backwards.

The cylinder is supported and directed by iron bars ranged along the bench on which it is to roll; the leather being a little moistened, is extended on the bench, and the cylinder is passed on the leather; the mark of the threads which are on the cylinder remain impressed on the leather lengthways, and by changing the position of the skin, new strokes are made, which cut the first at right angles or pretty near; the intersection of these lines forms squares or lozenges on the grain of the leather, which please the public eye, because they find them on the *Russian leather*; this operation, so simple in itself, is notwithstanding one of those things on which much importance is laid; this proves the utility arising from the disclosure of the mechanick arts, by banishing

those mysterious trifles which retard their progress.

The *Russian* leather being thus printed, is smeared with *Russia* oil, which strengthens the grain, and hardens the surface of the leather, so that water cannot penetrate; this oil is the grand secret, as they pretend, therefore I cannot precisely tell the composition; but I know that it is composed of oil distilled from *savin* and *rue*, two plants sufficiently known; the leaves and stems are indiscriminately used; the quantity of three or four pounds are put into glass matrasses, which are covered with heads luted with mastich; a fire is lighted under them, and in the space of thirty hours there comes over one or two pounds of *em-pyreumatical* oil, which they use to impregnate the *Russia* leather; I have also heard that they use the bark of birch reduced into powder.

The red colour which is usually given to *Russia* leather, is likewise kept a secret. It is chiefly made with *Brazil* wood, and especially with that of *Fernambouc*: it is well known that this wood is greatly used in dying, with alum and tartar, without which its colour would not be solid: they extract from it, by means of acids, a kind of carmine; they also make *liquid lacques* from it for miniature paintings. (See *Lemery's* dictionary of drugs.) The manner of using it for *Russia* leather, is to boil it for five or six hours with some other ingredients, which they keep unknown to us. The proprietors of the *Royal Manufactory* of *St. Germain-en-Laye*, have only one person who has the knowledge of it, and the process is preserved under several keys, as being the most precious treasure of that company; nevertheless nothing is easier

easier than to make as solid and a beautiful dye as theirs*.

The *Fernambouc* wood used for *Russia* leather, makes a false tinct, as most of the colouring woods do, for its colour will not resist the proof of tar-tar, but sufficiently resists air and rain; they use it for *Russia* leather as the more solid red dyes bear too great a price for this manufacture. Sometimes three layers of colour are sufficient, and sometimes they are obliged to lay on ten or twelve, and these do not always succeed; there are *Russia* leathers which have always a black cast, and the cause could never be discovered.

France still imports from *Russia* a great quantity of this leather; the manufacture of *St. German* does not furnish more than the value of twenty thousand livres a year, and which serves chiefly for the use of the troops; the price of *Russia* leather is about thirty-six *sols* a pound; which is only a fifth more than the price of black cow leather, but it is in general heavier than other kinds of leather.

The black *Russia* leather is made with the same oil, and passed under the same roller; they give

* One would be apt to think this secret is not so wonderful, seeing the manufacture makes but a small quantity of *Russia* leather, and the demand so great, that the *Sieur Teybert* has been dismissed at least these twelve years past, with a pension of only 600 *livres*. He has offered several times to sell his secret for 600 *livres*, but found no purchaser.

it two or three smearings of black, as to black cow leather: it differs from it only in the hardness of the grain, and the smell, which the *Russian* oil communicates to it.

Of Red Cow Leather.

Tho' the curriers of *Paris* do not make *Russia* leather, yet they make *red cow* leather, which has no smell, is of a finer colour, but less solid than that of *Russia*, the colour is given with *Brazil* wood boiled in lime water, and a small portion of *cochineal*. The saddlers, harness-makers, and trunk-makers use these cow or calve skins for equipages.

Cow hides that are to be coloured, are not to be tallowed, but a little clear oil only is applied to them very lightly, just to soften the skin; such skins are to be chosen as are without defect, free from the scorings of the knife, from being horned, or scratched, and such as have a quick or lively grain, that is, fine, firm, and well preserved.

To make this leather take a cow hide with the tan on, whose grain is lively; it must be trod, softened, fleshed, and trod again whilst wet, then hung in the air like the skins after the *English* manner; a layer of oil is smeared on the grain, and a layer of oil and *dubbing* on the flesh side; this requires about half an hour in all, and it is put to dry.

When dry, they gave it a wash of alum with a brush, from tail to head, and across; the alum serves

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serves to eat the remainder of the greenness of the skin, and to *dress* the skin, as the curriers call it; in short, it prepares the skin to receive the colour.

It is trod in its alum, until it is soft, in small folds, doubled grain to grain; the paumelle is drawn on the flesh side alternately on the four quarters; it is hung in the air to evaporate the moisture of the alum, when dry the *cork paumelle* is passed on the grain.

To prepare the *red*, into eight pails of well water, in a very clean vessel, put ten pounds of quick lime to slacken. Two days after this water is taken out without disturbing the grounds, and poured into a copper boiler; take *Brazil* wood fresh cut, of that which is not soft or white, and boil it over a quick fire; eight pounds of wood makes two pails of red, and suffices for eighteen or twenty cow skins, each pail containing eighteen or twenty quarts.

It would be better to buy it in the solid piece, and cut or rasp it occasionally when wanted; less would serve than when bought in chips, and it would lose less of its strength.

These two pails of red are to be boiled 'till reduced to one; then the first red is drawn off, and the boiler is filled with lime-water out of the same vessel, which is likewise boiled half away on the same wood; this second pail is mixed with the first. Add about half an ounce of well powdered *cochineal*, which must have but one boil, and then is taken from the fire, and whilst yet boiling, about the bigness of an egg of unslacked

lime is cast into it ; and when cool it is fit for use.

The first wash of red is given from tail to head and across, and the skin exposed to the air ; the second red is given after the same manner, and it is left to dry thoroughly ; it is then doubled grain to grain, the paumelle drawn on the flesh side, from head to tail and across, after which the third red is given, to which they add the white of an egg.

The third red being given, the skin is hung in the air to dry, after which it is smoothed or flecked ; and that the flecker may slide the easier, a piece of woollen rag lightly oiled is passed on the skin ; then *fleck* from tail to head and across, on the grain side, and the red cow leather is finished.

Some curriers prepare their red dye after another manner. They begin by making an alum water, composed of three gallons of water to one pound of alum ; it must be placed on a slow fire, just sufficient to melt the alum ; this solution is then put into a large crock, and six quarts of clean common water is poured over it, which is sufficient to alum three dozen of calve skins.

Three pounds of *Brazil* wood, with a piece of roche lime, of the size of an egg, is boiled strongly in about fifteen quarts of water, for five or six hours ; this decoction the curriers call *Brazil*.

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The skin being in the same state as if to be blackened, is rubbed over with a piece of wool dipt in the alum water, and when thoroughly dried it is rubbed with the *Brasil*, after which it is again dried, washed again with the alum water, a new smearing of *Brasil* put on, and the same repeated a third time.

The sleeker which some curriers use for red cow leather is made of glass in the form of an onion, three or four inches broad by one inch thick, convex at bottom, and having on the top a kind of stem or cylinder, which serves as a handle; some have two handles, which is still better. After rubbing the skin with a little barberry juice, it is dried, then sleeked strongly; and this is the last operation given to calve and sheep-skins made in red.

Red cow leather is not sold by weight; the size and quality constitute the price; but in general a skin of twelve pounds will sell for eighteen or twenty *livres*, and sometimes for twenty-four *livres*.

OF
MOROCCO LEATHER.

MOROCCO leather was formerly manufactured in *Asia* only; it is now made in great perfection in *France*. In this treatise I shall describe the methods practised in *Africa* and at *St. Hippolyte* in *France*. The city of *Morocco* was once famous for this manufacture, and from thence this kind of leather took its name.

The manufactory at *St. Hippolyte* is carried on by Mr. *Barois*, whose success proves his abilities. It was established in 1749, and in 1765 he obtained letters patent to enjoy the privileges of a royal manufacture. But as the *Moroccos* of the *Levant*, and in particular those of *Nicosia*, in the island of *Cyprus*, and of *Diarbekir* in *Asia*, are greatly esteemed, I shall here give the methods practised at those places from the description of M. *Granger*, who worked on the spot, and communicated his discoveries to the academy at *Paris*.

M *Granger* was a very skilful and active surgeon, who was sent by the count de *Maurepas*, then minister of the marine, into the *Levant*, *Egypt*, *Mesopotamia*, and *Persia*, at the expence of the king of *France*. To pursue his discoveries he underwent the greatest bodily fatigues, often travelling barefoot, and complying with all the rude and barbarous customs of the *Arabian* artificers. To this gentleman's knowledge and perseverance *France* owes many useful improvements
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in arts and in physick, each of which have been honoured with an ample detail in the memoirs of the academy from the year 1735 to the year

1745.

The observations and accurate detail of the processes in this manufacture, made by a man of so much knowledge and abilities, may be relied on, notwithstanding the boasted mystery and secrecy of the *French* manufactures at *St. Hyppolite*.

The skins used for *Morocco* are those of the common goat, and of wild goats when they can be procured; the best are brought from *Auvergne*, *Limousin*, *Touraine*, *Burgundy*, and especially the *Bourbonois*; they also come from *Switzerland*, from *Cork* in *Ireland*, and even from *Barbary* and the *North*.

In the *Levant* they prefer the skins of he-goats, because strongest, but in *France* they seldom use any but young he-goats, the others are too strong and too costly. The belt makers prefer the skins of he-goats, being so strong as to require no lining. The tapestry-makers also use them for the backs of elbow-chairs and the tops of writing-desks.

These skins are dried in the hair, and not those which have been limed, peeled, and dried, because the grain would be too low, and would appear ugly; for after the brightness of the colour, the grain constitutes the beauty of *Morocco*. Besides, skins twice dried becomes too stiff and stubborn, and are reserved for the *Chamois* leather-dresser, under whose hands the oil and the mill restore the softness.

Of

Of liming the Skins.

SKINS intended for *Morocco*, being dry and in the hair, are first steeped in stagnated water for three or four days to soften; they are afterwards pared on the beam, then steeped again for twenty-four hours longer, when they are a second time pared on the beam; they are then put into such lime-pits as are spent with ox or calve skins; they are two days in the pit and one out, much in the same manner as calve skins; ten dozen are commonly steeped at once, which remain about one month in the different pits before the hair is taken off, observing to take them out and to pile them night and morning. When the hair is off they are twice pitted, in order to raise them, viz. once in a second fresh pit, where they remain three days in lime, and five days in pile; and twice in a new pit, which must have been made four days before at least, that it may have had time to cool and to slacken. In summer the skins fill soonest, because the heat forwards them.

At *Nicosia* they put the skins intended for *Morocco* into lime reduced to powder, for twenty days in summer, and twenty-five or thirty in winter; they are afterwards washed in fresh water, the hair taken off, and fleshed, then powdered lightly again with lime; they are steeped in cisterns of water for one hour, and strongly washed; then washed several times in other cisterns made for that purpose, and trod with the feet for one or two hours; the water is frequently changed by means of two cocks, one of which lets in the clean water, whilst the other discharges the dirty; when they are well cleansed and very white they are extended on poles to drain.

At *Diarbékir*, a city of *Turkey* in *Asia* in *Diarbeck*, formerly *Mesopotamia*, they lime pretty near as our *Tawyers*. Some pretend the water of the river *Tigris* is essential to the beauty of *Morocco*, but that is a mistake, for there they use well water, or that of a small rivulet whose spring rises three leagues from *Diarbékir*, brought thither by an aqueduct. At this place the goat skins are soaked twenty-four hours in water, and scraped to take off the grease; when they are very clean they are smeared over on the flesh side with a liquid paste of lime, folded and piled, and thus left for three days; after which they are exposed to the open air, by extending them in the shade in summer, and in winter giving them the sun; they are turned now and then, and when dry, the flesh and hair are taken off: they are laid in pits made like ours, where they remain two or three days in summer, and sometimes a fortnight in winter; after which the curriers take them out to renew the water of the lime, in which they soak and wash them five or six times; they are then soaked a second time in the same water during six days; these pittings (which without doubt are weak) are five times repeated, and care is taken to wash the skins five or six times at each change of water. They are then drained, and worked on the flesh side with a blunt iron, until they are very clean and smooth. They again are steeped in lime water, observing to stir them each day, raising them one after the other.

After these six last days in the pit, they are taken out, and washed several times in fresh water, until they are perfectly clean; this is continued for

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for three days successively, they then are extended to be half dried, in which state they are put into dogs excrement.

With us, all skins after being limed are haired and river-worked, as I have shewn in the art of tanning; but *Morocco* cannot be too much worked in the river, for if any lime remained the spots would appear on the colour, and change it to a dirty purple.

When the skins are taken out of the last pit they are thrown into the river for three or four hours, and stirred each quarter of an hour to wash out the gross parts of the lime, after which they are fleshed, then put into buckets, where they are stamped with wooden pestles for half an hour, then put on the beam to be worked with the fleeking-stone on the grain, and immediately after they give them a fashion with the knife on the grain and flesh; this operation is repeated five or six times; they then are stamped again with the pestles, by three men to every two dozen of skins. Some have their buckets bored full of holes at the bottom, in which they are there stamped for one hour, flinging fresh water at times over them.

They must be stamped at each operation of the river work, that is, at the fleshing, counter-fleshing, or second fleshing, &c. as hereafter described.

At the manufactory at *St. Hyppolite*, they follow the order of river-working in the following manner. When the skins are taken out of the lime pit they are steeped in a vat of water to rinse them, and then fleshed; this is the first operation. They then are steeped five or six hours.

hours in another vat of water, and counter fleshed; this is a second fleshing, which forms the second operation.

They are stamped for the first time, and steeped in another vat of clear water; they are stamped a second time, and worked on the flesh; this is the third operation. They are stamped the third time, soaked in a vat of water; stamped a fourth time, sleeked with a kind of slate with a wooden handle, and this is the fourth operation; they work them immediately with the round knife on the grain, and this is the fifth and last operation of the river-work.

Of Dogs Confit or Mastering.

The river work finished, the skins are put into the *dogs confit* or *mastering*; for every four dozen of skins, they add one bucket of dogs excrement, containing fourteen or fifteen quarts, which is worked up with their hands into a kind of pap, and well diluted. The skins are flung in, stirred and worked in the *mastering* for some minutes, then turned and left to rest.

They remain about twelve hours in the *mastering*, which opens them and takes off the rawness, disposes them to relax, fill, and ferment; this excrement, by its alkaline parts, also cleanses them, and takes out that grease which would hinder them from taking the colour. I shall hereafter speak of *bran mastering*.

At *Nicosia*, they spread the *mastering* on the skin, about one sixth of an inch thick, and esteem this operation most essential to the preparation

tion of *Morocco*: for which reason, whenever they carry on this trade in that country, they gather the dogs excrements with as much care as country people do the dung of other animals for the manure of their lands.

In *July*, 1735, the plague raging greatly in the island of *Cyprus*, a person represented to the governor of *Nicosia*, that the dogs contributed greatly towards that disorder, upon which he ordered all the dogs to be killed. The carriers and merchants hearing of this order, went in a body to the governor, represented that the commerce of *Morocco* was of great importance to the city, and that it would be ruined, if the dogs were destroyed, as their dung was absolutely necessary in the preparation of *Morocco*. This remonstrance appeared of so much consequence that the edict was revoked at all hazards. *Mastering* or *Fecal* matters are also used to prepare cotton to receive the fine red of *Adrianople*, according to a memoir, published in 1765, at the expence of the crown, by order of the minister, the substance of which was as follows.

Dying of Cotton with Madder of a fine Scarlet.

Dilute twenty-five pounds of sheep's dung in five hundred pounds of *lye* of *Barilla*, with twelve pounds and a half of olive oil; in this soak one hundred weight of cotton already scoured in a strong *lye* of lime water; this operation is repeated three times, and is called *Sikiou*. When the cotton has been galled, alumed, dyed with the blood and madder of *Smyrna*, and roused with ashes

ashes and soap, it is dipped again in the *sikiou*, and this fecal matter makes the red more lively than the finest carnation of *Adrianople*.

At *Diarbésir*, they make use of these *masterings* in a different way. Whilst the skins are drying, they fill great hollows made in the earth, like our lime-pits, with dogs dung, which is diluted to the consistence of honey or of thin pap, in which they soak the skins for eight days in winter, and three in summer, treading them each day with the feet. They are taken out of this fecal matter and well washed with fresh water, after which another *mastering* is made with bran diluted in water, in which the skins are soaked six days in winter and three in summer, observing to tread them each day with the feet, the same as in the dogs *mastering*; they are then taken out, washed in fresh water, and dried for dying.

Of the Sumach Vat.

After the *mastering* with dogs excrement, the curriers in the island of *Cyprus* put the skins into another kind of pap, made with the leaves of *sumach* reduced into powder. The shrub which affords these leaves is also called *Rhus* or *Rhoë*: *Rhus folio ulmi Caspari Baubini in Pinace*, p. 415. & *Tournefortii Institutionum*, p. 611. *Rhus foliis pinnatis obtusiusculè serratis ovalibus subtus villosis*, *Linnaei Specierum*, 1. ed. p. 265. It bears small flowers in the form of a rose, which form large white knots; its fruit is a round capsula filled with one spherical grain, flat, round, and hairy, called *rubeum*, or *rhus obsoniorum*, because the cooks use it; its leaves are long and crenellated. This shrub grows in great plenty in the rocky parts of the island.

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island of *Cyprus*, in *Spain*, and even in *Languedoc* and *Provence*; it is refreshing, drying, and astringent; as an astringent, it is of use to *Morocco*.

The leaves of the *Sumach* being reduced into powder, a thick pap is made thereof, in which the skins are steeped one by one, and then thrown into square reservoirs, where they remain to macerate for thirty hours; then they are worked with the feet and hands, after which they are washed and cleaned.

This *Sumach* vat practised at *Nicosia* is replaced by that of gall-nuts, if the skins are intended for yellow.

To tan or vat the *Morocco*, in *Provence*, they make use of the leaves of *Roudou* (*Rhus myrtifolia*, C. B. p. 471) that is, *Myrtle-leaved Sumach*, which I have spoken of before in the Art of Tanning; they use also the leaves of the *Rastenele* or *Mastick* tree. The leaves of these three shrubs are indifferently made use of; for, by either of them, the *Morocco* is tanned in a short time, and acquires a brown colour. The *Rastenele* is the same as the common *Lentiscus* of most of the botanists: it is called by *Linnaeus*, *Pistacia foliis abruptè pinnatis, foliolio lanceolatis*, Spec. p. 1026, first edit. At *Paris*, they prefer gall-nuts to sumach, though they cost more, because they have more strength, and make the flesh of the skins whiter.

Of Confit or Mastering of Bran.

In the island of *Cyprus*, after the operation of sumach, they make a distinction between skins intended for different colours; those that are to be

be yellow, go into the gall-nut; but those that are to be red, are worked with *bran*, *figs*, and *salt*.

The first *mastering* is a paste made with bran, in which the skins are piled for two days, one upon another; at the end of which time they are taken out, cleansed with the peeling instrument, (which is made much like our curriers knife,) well washed with clean water, and drained by extending them on poles. At *Diarbékir*, they make a kind of pap with bran, in which the skins are steeped for three days in summer, and six in winter.

Of Confit or Mastering with Figs.

At *Nicosia*, whilst the skins are draining, they prepare a mastering with figs; for which they take thirty pounds of dried figs, boiled in thirty quarts of water, until they are reduced into a kind of pap; forty skins are soaked in this for twenty-four hours, which softens, swells, and dilates them, and raises a kind of fermentation, which causes the red dye to penetrate with more facility.

After this, they are washed clean in fresh water, and when drained, they are sprinkled with fifteen or sixteen pounds of very fine powdered salt, and piled one upon another, in which state they remain a fortnight; longer might spoil them. This produces a new fermentation similar to that I have mentioned on strong hides, raised by oak liquor, which the tanners also salt. At the expiration of the fortnight, they are steeped and washed seven or eight times in fresh water, hung and drained,
after

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after which they are dyed. This is the mode of preparation in the island of *Cyprus*.

Continuation of the River-work, at Paris.

At *Paris*, when the skins come out of the *mastering* of dogs dung, they are rinsed, and another working given them on the flesh side with the round knife; this is the sixth working. After which they are trod for the fifth time, and soaked in water five or six hours, as in the other workings; they are then worked again with the sleeking slate, as before the mastering; this is the seventh working: and immediately they are worked on the grain and flesh side, which is the eighth; they are trod for the sixth time, and steeped again; taken out, and a ninth working given on the grain and flesh side; this done, they are trod a seventh time, and steeped in a vat of water; they then receive a tenth working on the grain alone; they are trod for the eighth time, steeped in a vat of water, taken out to drain, which is the eleventh and last working. In the draining they are worked on the grain and flesh side: when rinsed and drained for two hours, they are prepared for the colour.

It is evident, by these eleven workings, of which many are doubled, how laborious the manufacture of *Morocco* is. Goat skins require this tedious operation, being naturally stiff and hard.

Of aluming the Skins.

When the skins have been washed and wrung with an instrument made for that purpose, they are prepared for the dye, the first operation of which

which is to alum them. Take twelve pounds of *Roman* alum for every eight dozen of skins, which dissolve in two buckets of hot water, containing fifteen quarts each.

The *Morocco* dressers prefer *Roman* alum to all other kinds; it is of a reddish colour, and brittle. *English* alum blackens the skins, and is not so good in any respect.

The skins are folded flesh against flesh, that the grain alone may be alumed, and thus dipped in a pail of alum lukewarm; it is stirred in it for the space of half a minute, taken out, and put on a beam four feet high, placed in the work-house for that purpose.

The alum water drained out, they are wrung with a wooden wringer (iron is not to be used) and hung on a wooden beam placed in a corner of the work-house to drain, placing an alum bucket under them to save the water that drops from them; they are wrung two at a time, after which they are *stocked* on the beam to take out the folds, and folded flesh to flesh.

The bucket in which the skins are alumed is somewhat shorter and broader than that in which they are coloured, and which I shall describe hereafter. It requires one hour and a half to alum eight dozen of skins.

The alum water is preserved, and serves again by adding alum and water to repair what it has lost; and at the second mixture it requires not more than nine or ten pounds of alum.

Of the Manner of dying red Morocco in the Island of Cyprus.

The skins being alumed, are prepared for the dye. This article properly belongs to the dyer; but as the *Moroquiniers* are accustomed to dye their *Morocco*, I shall follow them in this operation.

I shall begin with red *Morocco*, being most esteemed and most in use. The colouring matter is kept a very great secret in *France*, where they say it is composed of the mixture of a great number of drugs. M. *Geaffroy* the younger says, in a manuscript, that he was informed they used stick-lacque, reduced into powder with gall-nuts, alum, and a little cochineal. In *Cyprus*, they use none but kermès.

The kermès, or chermès, in Latin *Coccus baphica*; *Coccus insectorius*, *Scarlatum*, scarlet grain; or Venetian scarlet, is a gall-insect hatched and found commonly on the shrub called *Ilex acculeata Cocci glandifera*, or the holm oak. In *Languedoc*, it is called *Vermillion*. Some authors have also called it *Cochineal*; but these must be well distinguished: cochineal is an insect which lives on the opuntia or Indian fig, and of which a much finer dye is made, which is the true scarlet: I shall speak of this hereafter. The *Kermès* is about the size of a lentil; it is gathered in *Languedoc*, *Provence*, and *Spain*. See M. de *Reaumur*, who has given a very good description, of it in his *History of Insects*: see also *Marfigly*, *Hist. Phys. of the Sea*, *The Physical Dictionary*, *The Dictionary of Commerce*, M. *Hellot*, *Mem. Acad.* 1741, pag. 50. M. de *Bomare*, *Diction. of Natural History*.

For

For forty skins they take twenty-five ounces of the finest kermès that can be procured. It costs at *Paris* from four livres to one hundred and ten sols *French* the pound, containing sixteen ounces; when dried it is powdered, then boiled in eight quarts of water *, and when it has taken one boil, a fifth of a pound of alum is flung into it, divided into five or six parts, and kept boiling half a quarter of an hour, in which time all the alum is cast in; then the liquor is suffered to boil till it has diminished four or five fingers, and the dye is made. The more alum is added the deeper the dye, on the contrary the more lively it will be in proportion to the lesser quantity of that salt.

The colour being thus made, about a pint and a half is poured into a vessel whilst lukewarm, into which a wisp of cotton is dipped, and rubbed on the grain side of the skins; when the dye is laid on they are wrung in the same manner as a wet cloth would be, to squeeze the water out. When the forty skins are thus dyed and wrung, they begin again with the first, which is a second time dyed with the cotton soaked in the colour, and again wrung as at first; all these skins are thus dyed and wrung five times.

This done, fifteen pounds and a half of gall-nuts finely powdered are added to ten quarts of cold water; the forty skins are soaked in this liquor one after another; when taken out of the

* The quart of *Paris*, to which I have reduced the *Levant* measure, contains forty-eight cubic inches, and weighs about two pounds.

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gall-nut, they are washed ten or twelve times in very clean water, and carelessly flung one over the other, trod with the feet, and worked with the hands, to get the water out; when the water is well expressed, they are brought into dry lofts, where they are extended on the floor.

These skins thus extended, the hand is dipped in oil of *sesame* (a kind of corn) with which each skin is rubbed on the grain side; this gives it a lustre and softness, and prevents its crisping; they are afterwards dried in the shade or in the sun. Such is the process at *Nicosia* for colouring red *Morocco*.

The method of dying the same as at Paris.

At *Paris* the dye of *Morocco* is different, and carried on in a different manner. They use a copper boiler well tinned; as copper untinned would hurt the colour, they are frequently obliged to tin this boiler; it is twenty-eight inches in depth, and twenty-seven in diameter. In this they put the drugs appropriated for the dye, which, according to M. *Geoffroy*, consists of *stick-lacque* reduced to powder with *gall-nuts*, *alum*, and a small portion of *cochineal*. M. *Barois* has assured me that M. *Geoffroy* is totally mistaken; but that is of no consequence, since with *kermès* alone this dye may be made in the highest perfection.

The *cochineal* is a small insect, the inhabitant of a fat plant, called *Raquette*, *Cardasse*, *Nopal*, *Opuntia*, or *Indian Fig*; it is cultivated with great care at *Mexico*, and is there dried for foreign markets. This drug costs at *Paris* about twenty-four

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four livres a pound, and is used for the finest scarlet dye.

Over the boiler is placed a linen sieve, upon which clean water is poured; this sieve is to prevent dust from entering into it. Whilst boiling, the mixture is stirred from time to time with a wooden rake, to raise the drugs, which otherwise would precipitate to the bottom of the boiler and stick to it; hot water is added as it diminishes in boiling, for which purpose a small kettle of water is placed on the furnace. The boiler is supported in a brick furnace by trunnions on each side, so that there is a space between the vat and the work, that the heat may surround the vat on all sides; the funnel of the furnace is splayed off, ramping or inclined, so as to enter a chimney below the surface of the vat: this attention is necessary for the greater neatness. The upper liquor of the boiler is drawn off into a lesser boiler of eighteen inches in depth, and eighteen or twenty in breadth. This must also be covered by a sieve, and kept up by a moderate heat, so as the hand may be held in it; the heat is necessary to make the colour take; but if it was too hot, it would shrivel the skins, render them like parchment, and spoil them. Besides, the colour clarifies itself in this boiler, by depositing its dregs. With a pewter vessel they take out a pound and a half, or three half-pints, of this colour, which is poured into a trough placed on an inclined plane.

The skins being folded belly to belly, lengthways, with the grain outward, as already described, the workman takes it with both hands, and passes it in the trough from end to end, bringing

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it towards him five or six times; he then turns the other end of the skin, holding the head with his right hand, that the half which was above may be soaked in its turn, and thus he continues to pass the skin in the trough, until the liquor that was poured in be almost imbibed; he then flings out the remainder, and proceeds with another skin in the same manner. The tail part must be first soaked in the deepest part, because it requires most colour, and they lay it down by degrees, to bring the head to the middle of the trough, which part contains least liquor, as the trough is on a slope, and thus it appears equally dyed in all parts. When the skins are dyed and soaked they are placed on the beam, smoothly, and without folds, one on the other, forty-eight of which are placed at one end of the beam and forty-eight at the other. When the eight dozen are thus placed, the first heap is turned over, laying those at top now at the bottom.

When all the skins have been passed three times (sometimes four) in the colour, they are put into a bucket of clear water unfolded, the better to wash them; after which they are flung on a beam, where they are extended one upon another, grain to grain, and flesh to flesh.

The manufacturers say that thunder is prejudicial to these colouring boilers, that is, that a thunder storm may turn them, therefore it is better to postpone this work should the weather prove doubtful.

The skins being dyed and soaked the third time, they are rinsed, unfolded, taken by the two pates, dipped

dipped in a pail one after another, and extended on the middle of the beam, grain to grain, and flesh to flesh, that the colour may have time to penetrate the better ; the extremities must be folded back on the skins, that they may not lose of their colour ; they are thus left the whole night, or at least they are let to drain five or six hours, at which time they are fit to be flung into the gall-vat.

The bottom of the trough in which the *Morocco* are dipped is thirty inches by thirteen ; but, as it widens, it has forty inches by twenty-five on the edges, and about one foot in depth. It must be made of deal ; oak is bad, as it browns the colour and spots the skin : for greater nicety, it should be lined with lead or tin.

Three workmen are employed in this operation : one pours out the colour, the second dips the skins, and the third puts it on the beam. These three men are about twelve or fifteen hours colouring eight dozen of skins.

The quality of the water is a material thing to the colour of *Morocco* ; rain water is too hard : there are also some nice circumstances of which one is not always master, for, with the same drugs and the same water, a finer colour will be obtained at one time than at another.

The *lacca*, *lacque*, or *lake*, is a kind of wax or reddish resin, gathered in *India*, on the branches of trees, where it is deposited by flies : this resin, boiled in water with some acids makes a dye of a very fine red. The lacque is brought to us in sticks from *Bengal*, *Pegu*, and *Siam*. The East-

India company carries on this commerce: it costs about six livres a pound at *Paris*. *Grain lacque* is that which is detached from the sticks by passing it between two stones: it is from this grain lacque that sealing-wax is made. M. *Hellet* (Mem. Acad. 1741, p. 64) gives a method of extracting this colour by means of the great *comfrey root*.

It is this dye which, the author of the Dictionary of Commerce, says, is used in the *Levant* for dying *Morocco*: I have before observed, that it is the *kermès* they make use of at *Nicosia*; but, at *Diarbékir* they use the *lacque* or *cochineal*, and M. *Geoffroy* thought it was the same at *Paris*.

The *Laplanders*, to redden their skins, wet them with their spittle, after which they chew *tormentil* root, and rub the skins with the dregs, which gives a tolerable good red; it is probably owing to the urinous salt of the spittle, which lustres the dye of this root. This volatile urinous salt, common to all animal liquors, produces the same effect on the *orchel*, which is a kind of moss the dyers use with lime and urine.

Of the Red Morocco Vat.

Red Morocco requires the vat. At *Paris* the day after the skins have been coloured, they proceed to the vat, which is made of gall-nuts: but the vat is to precede the dying of *yellow Morocco*. The gall-nut is a kind of excrescence found on the oak: the best come from the *Levant*, *Smyrna*, *Aleppo*, and *Tripoli*; those of *Aleppo* are reputed the best: the *French* galls growing in *Gascony* and *Provence* are greatly inferior to them, being generally

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rally somewhat red, light, and smooth, whereas those of the *Levant* are heavy and thorny: this perhaps has given them the name of thorny gall, or rather *Galle Alepine*, because they come from *Aleppo*. The galls from the *Levant* are of three kinds; the black, green, and those which are half white: the dyers use them according to their quality: the black and the green dye black, and the white dye linen. The light galls, the produce of *France*, which are called *Cassenolles*, are used by the silk-dyers to make a black: ink is also made with black and green galls: of these kind of galls also is made hatters black, mixed with log-wood, verdigrise and copperas, or vitriol of mars: this black, when the hatters have done with it, is used by the curriers.

Mixed galls cost 72 *livres* a hundred before the war; in 1763 they were raised to 160 *livres*, but these galls are mixed with black and white, and only the white is to be used for *Morocco*: the black is sold to the hatters for their dye. It requires ninety-six pounds of white galls for 96 skins, which is the quantity that four men can turn at once in the vat.

Put fifty pound of galls, powdered and sifted, into cold water, which being stirred a little, the skins are flung in, and the vat kept stirring. One hour after add twenty pounds more of galls, and an hour after, the remainder of the ninety-six pounds, whilst four men keep them continually stirring with shovels, for twelve or fifteen hours without intermission.

The vat in which these ninety-six skins are turned, must be of deal, never of oak: it must

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be four feet and a half diameter, by three feet in height. Those who stir the skins, bring those which are in the middle, now and then, to the edges of the vat, that the galls may be equally distributed, and penetrate the whole. When these men go to their meals, they are relieved by others, that there should be no stop in this operation.

The skins being left all night in the vat, finishes the tanning : a board is placed across the vat to drain them and to unfold them, and the skins are immediately put down again ; this is twice done in the space of fifteen hours. Care must be taken whilst the skins are at rest in the vat, to spread the uppermost with the flesh outwards, to preserve the rest, and thus they pass the night in the vat, sometimes twenty-four hours, if the season requires it ; but this is seldom done. Iron about the vat would be dangerous ; and in general, in all operations of skins, and particularly of *Morocco*, it is carefully to be avoided.

The *Gall-vat* is used in *Nicosia* before colouring, for those skins which are intended for yellow ; (red *Morocco* requires before the dye, sumach, masterings, and salt only,) for every forty skins that are to be dyed yellow, a cold infusion is made during six or seven hours, of eighteen or twenty pounds of galls in eight or nine quarts of very clear water ; the skins are steeped in it twenty-four hours, observing that there be just liquor sufficient to moisten the skins without floating on the top ; they are taken out at the expiration of twenty-four hours, and are well washed in fresh water, then dried, both in the shade and in the sun ; after which they are a second
time

time washed again and dried as before: this is the preparation for *Morocco* intended to be dyed yellow.

Continuation of the red Morocco in the Levant

Red *Moroccos* being dyed, they are put into a decoction of galls: this is done at *Nicosia*, at *Diarbékir*, and at *Paris*.

At *Diarbékir* the red morocco is only prepared with fecal matter and bran; finished with the must of the grape, or honey, salt, gum lacque, or cochineal, alum, and afterwards galls, which makes the last operation. For every fifty skins prepared with dogs dung and bran, they take eighteen pounds and three quarters of *Pecquemese*, which is the must of the grape, or in defect of this, so much liquid honey, which is so heated as to bear the hand; the skins are dipped in one after another, piled, covered over with a packing-cloth, and thus left for three days, at the end of which they are washed two or three times in water, in which nine pounds six ounces of common salt has been dissolved, after which they are half dried.

Whilst the skins are drying, they put eighteen pounds three quarters of gum lacque, into one hundred and eighty-seven pints and a half of water, and in defect of lacque, three pounds, eight ounces, and two drachms of cochineal powdered, into one hundred and fifty pints of water; it is diluted in the water, and boiled for three hours, with about forty drachms of powdered alum: when it is cooled so as to bear the hand, the fifty skins are rubbed over with it, one after the other;

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this is four times repeated, observing each time to extend and pile them one upon another. They are then dipped one after the other in cold water, in which fifty drachms of alum has been dissolved; when half dried they are soaked and trod in a decoction of galls prepared, as I shall shew on the subject of black or yellow *Morocco*; afterwards they are washed in fresh water, dried in the shade, or by a temperate sun: when dry, they are *sleeked* and *lustred* with linseed oil, like the black morocco. The dying of red and yellow morocco must be done in a warm place.

Continuation of the red Morocco at Paris.

I shall now return to the *Moroccos* at *Paris*, which have been dyed red and put in the vat. When taken out of the gall-vat, they must be washed in a clear water, to take off the superfluous gall, as was done when taken out of the dye. When washed, two men hand-wring them by pairs; they are shook and extended lengthways on a table, to receive the oil one after another, the flesh side being on the table, and the grain upwards.

The oil is contained in a wooden bowl; a sponge about the bigness of an egg, or a swab of wool, is dipped in the oil, and passed on the grain to soften them, and to prevent the air from crimping and hardening them; they are hanged on hooks by the pattes, the head downwards, grain to grain, at a small distance from each other, and are so disposed, that the current of air may strike side-ways in the intervals, for if it struck the surface of the grain, it would destroy the colour. About two pounds of oil are required for

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for the eight dozen of skins, and two men half a day to shake, oil, and hang them up.

At *Nicosia* they use oil of *sesame*, or of *jugeoline*, which is the oil most used in the *Levant*.

These moroccos remain one or two days (more or less, according to the weather,) in the drying-loft; sometimes they are taken down the same day: in winter they often require a week: however they are taken down as speedily as possible.

Being thoroughly dry, they must be curried and glazed, being first folded two by two in small whips, grain to grain, and trod on a clean floor, two at a time, with curriers shoes, made for that purpose. One man may tread four or five dozen in a day. Then they are to be grained with a wooden graining-board, lengthways, breadthways, and cornerways, or from corner to corner. A man will grain four dozen a day.

They must be *perched* on the flesh side with the perching-knife, rubbing it with whiting, to prevent the knife from entering too far into the substance of the skin.

Black Morocco is glazed with a glass, made in the form of an apple, or a flat onion, worked on a table a little inclined: one man can glaze three or four dozen in one day.

Red Morocco is glazed with a wooden roller, held by both hands: and the skin extended on an oak-beam, on which there is a piece of pear-tree wood, projecting a quarter or an eighth

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of an inch : a weight with a small book is suspended on the side of the skin, which pulls it down, whilst the glazier holds and governs it with his thigh, letting it slide as necessary, in proportion as he advances in his glazing.

Each skin is twice glazed, that all intervals and furrows may be effaced by the return of the fleeker; this also makes the grain more shining : one man can glaze two dozen a day, for which he is paid twenty-four *sols* a dozen : this operation is delicate, and requires habit and skill to glaze equally and uniformly. The grain is lightly watered with a sponge to make the glazer slip easy, but this is not necessary the second time.

Glazing lays down the grain of the *Morocco*, but as the grain is a beauty in *Morocco*, they rise it again by means of a *cork paunelle*, which is lightly drawn over, without taking off the lustre, and this is the last working of red *Morocco* at *Paris*.

Continuation of the Yellow Morocco at Paris.

Morocco skins which are to be *yellowed*, require less precaution than those which are to be dyed *red*. They are dyed when taken from the vat, and it is the same with respect to all other colours, except red; they even let them dry after the vat, and these they call skins in *crust*; when they are to be dyed, they are wetted, trod in the water, wrung, half dried, alumed, and then dyed.

The *Avignon berries* is the only ingredient used in yellow *Morocco* : it is the grain of a tree called *Rhamnus catharticus minor* (Caspari Baubini in *Pinacee*;

Pinace, p. 478) and by *Linnaeus*, *Rhamnus spicis terminalibus floribus, quadrifidis divicis*, Spec. p. 193. (*Hortus Cliffortianus*, 70. *Flora Suecica*, 193.) that is, lesser buckthorn, or yellow berries: this kind of buckthorn, or this thorny shrub, which produces the *Avignon* berries, grows in *Provence*, *Dauphiny*, and *Languedoc*, from whence the berries are brought to the dyers.

One pound and a half of yellow berries in one bucket of water will dye four dozen of skins; this colour dyes easily, and though done after the vat, it is as solid as the red, which is given in *tripe*, that is, before the vat.

At *Nicosia* they use yellow berries, called *halagex*: they get them from *Caramania*, from whence they are brought to *Egypt*, and the islands of the *Archipelago*, where the *Rhamnus catharticus* does not grow; and they use the common yellow berry also.

The deeper the yellow is required, the more it must be forced with the berries: it may be brought to an orange.

At *Marseilles* they manufacture blue and green *Moroccos*; without a minute description of the operation of these dyes, suffice it to say, that a blue is made with *turnsole* and *indigo*; and a green with *verdegrease* mixed with a little tartar, or with a mixture of yellow and blue.

Yellow Moroccos of the Levant.

At *Nicosia*, for the yellow dye, they take about five pounds of *halagex* or *Avignon* berries, with
one

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one pound and a half of roche alum, which are mixed together and reduced into a very fine powder, and infused in six quarts of lukewarm water, over a very slow fire, for one hour or two, observing not to boil the liquor.

They put the forty skins, which are to be dyed yellow, into a kind of stove, extended on the ground one over the other; then two men taking each the extremities of a skin, one of them dips his hand in the yellow liquor, and, without any other instrument, passes and repasses it on the grain of the skin: when it is well dyed, they fold it in two lengthways, and as they are dyed, they are piled. They are then turned over five or six times, still placing them one over the other, that the dye may penetrate the better.

They are dyed yellow a second time, after the same manner, turning and returning them about forty times; after which they are dipped seven or eight times in very clean fresh water; they are then dried in the shade, perched on the flesh side to take off the filth, and the grain *lusted* with a stick.

Black Morocco at Nicosia.

They take the skins when they have passed the *sumach*; for they require neither bran nor figs, as the red *Morocco*, nor galls, as the yellow *Morocco*: they take six pounds of a vitriolic, astringent earth, which is found in the island of *Cyprus*, and which the natives call *Maurite* or *Maurizi*, and a handful of powdered gall-nuts, which are infused together, cold, for two or three hours, in forty-five or forty-eight quarts of water: this liquor

liquor is black ; each skin is rubbed once only, and as soon as it is dyed it must be immediately well washed in fresh water, for without this precaution the dye would burn the skin ; they are then extended to dry in the shade ; they make this dye more or less black, by adding more or less *maurite* ; they also put a little oil on the surface when they are almost dry.

In *France*, it is at the coming out of the *sumach*, or rather of the galls, that the *Morocco* receives the black, after graining with the paumelle, and sparring : they make the black of sour beer, in which old iron has been infused, as has been said in the *Art of Currying* : they use a ball of horse-hair or a rough brush, which is dipped in the dye, and with which the grain is rubbed twice, sometimes three or four times, drying the skins each time, except the last.

At the last dying, when they are half dried, they are trod and rubbed, then extended on a table, grained with the paumelle, and a little water flung on them : after sparring, they come again on the table, to be grained with the paumelle lengthways, across, and from corner to corner, this raises the grain ; water is again flung on them, and they are glazed afresh ; finally, they are grained a third time with a wooden paumelle.

They then *lustre* the grain either with barberry-juice, garlick, citron, orange, or sour beer, being strongly rubbed with a woollen cap or swab ; the edges are pared on the beam, perched with the perching-knife ; and a cork paumelle passed over to raise the grain : this is the last working.

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This work is nearly the same as that of fat goat skins, which I have described in the Art of Curry-ing. Copperas dries and burns the skin, and beer is preferred, because in some measure it feeds the skin, and gives it a softness far from burning and drying it. The black made of beer is best when old; it can scarcely be used before three or four months, whereas that of copperas may be made use of as soon as made, and this is the reason bad workmen prefer it.

Continuation of Black and Yellow Morocco at Diarbékir.

At *Diarbékir*, the skins which are to be put in black or yellow pass into the gall, but for the red they use the must of grapes or honey: for fifty skins intended to be yellowed or blackened, they take two *battemens*, or twelve *ocques* of powdered galls, which is diluted cold, as a liquid pap, in three *ocques* of water (an *ocque* weighs four hundred drachms, or three pounds two ounces, *French-weight*); as soon as the galls are soaked sufficiently and precipitated, the skins are put in and trod with the feet one after another, which is repeated three times in two hours; they are then left to soak in the decoction of gall till the next morning; when the gall pap is too thick, water is added to it.

The next day the skins are taken out, worked on the flesh side, trod three or four times separately, and when well cleansed, they are again put into fresh decoction or pap of galls, such as the first, well washed in cold water, and then dried.

When

When dried, and to be dyed yellow, for every fifty skins, they take two *ocques* of grain of *Jara*, or berries of *Avignon*; this is the grain or berry of a species of *Lycium* of *Caraminia*; *Rhamnus catharticus*; to which is added fifty drachms of powdered alum, which is diluted, like thin pap, in a sufficient quantity of hot water; with this dye they rub the skins, which must be moist to take the dye rightly; this operation must be done in a hot place.

When dyed, they are folded and piled one over another, and thus left till next day, when they are lightly washed in cold water, in which forty drachms of alum has been dissolved, which strengthens the dye and the skin; they are then dried and glazed, without using any kind of oil as a lustre.

At *Diarbékir*, for black *Morocco*, they use powdered galls twice, as for the yellow; when washed and dried, they take two pounds of a vitriolic ferrugineous earth, which they call *caraboya*, which is dissolved in a sufficient quantity of water; when the water is well loaded with it, the skins are rubbed with it till they appear of a fine black; they are then washed in fresh water, dried in the shade, glazed, and, lastly, lustred with oil of *Bezeriane*, or linseed oil.

Of the Commerce of Moroccos.

Red *Moroccos* are sold, at *Paris*, from sixty to eighty *livres* a dozen, weighing from eleven to fourteen pounds a dozen, when entirely finished.

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The yellow, blue, or green *Moroccos* are sold from forty-eight to sixty livres a dozen ; and the black *Moroccos* from fifty to fifty-five or sixty livres.

Morocco is used by tapestry workers, shoe-makers, belt-makers, saddlers, case-makers, and trunk-makers ; it is the most esteemed, the dearest, and the finest of all leathers : shoes made of black *Morocco* have this advantage, that they are cleaned with a sponge and vinegar, which restores their colour, and does not daub or soil the stocking.

Spanish Moroccos are most esteemed for goodness, yet those of *France* are often more beautiful ; but for quality and brightness of colours, those of the *Levant*, *Constantinople*, *Cyprus*, *Aleppo*, and *Smyrna*, are the most sought after.

The book-binders take only the smallest, finest, and thinnest *Moroccos*, and often pare them on the flesh side to make them thinner ; they pay from sixty to sixty-six livres a dozen.

They manufacture *red basils* at *Limoges* ; these are sheep skins dyed red, with less precaution than *Morocco* : they are much esteemed at *Paris*.

White *Morocco* is prepared much like *tawyers skins*, of which I shall give a particular treatise in the *Art of Leather-Dressing*. In this manufacture, they use some drugs to preserve the white not known to the tawyers, and which have not yet come to my knowledge. The river-work of white *Morocco* is carried on the same as for the red, because goat skins are very ungrateful and difficult

difficult to be worked. After all the different workings, that is, after the draining, they give it the bran masterings, where it remains four or five days in summer, and eight in winter. When the mastering has rose several times, and that it falls of itself, and rises no more; they whiten the skins with a paste made of eggs and milk as in *tawing*: they also pretend, that to prevent their spotting and spoiling easily, that there is another secret ingredient added which strengthens the grain of the white Morocco: if so, this must be an astringent. They are then grained by means of the currier's graining board, which must have a rough paumelle; they are lusted by rubbing them with a clean and dry linen.

White Moroccos are less used in *France* than in *Italy*, where large quantities are brought from *Smyrna*. The *Italian* women's shoes are made of it, and it has this advantage over all other white skins, that it is easily cleansed when soiled, being sufficient to wash it, and when dry to rub it with a cloth, by which it recovers all its quality and brightness.

The *cordouans* are leathers very like *Morocco*, but tanned with bark, in which they differ from *Morocco*, which are only tanned with fumach and galls; probably this denomination comes from the city of *Cordoua* in *Andalusia*, the same as *Russia*, *Hungary*, and *Morocco* have given their names to other kinds of leather.

Processes for dying Leather Red, and Yellow, as practised in *Turkey*, with directions for preparing and tanning the skins, as communicated by Mr. *Philippo*, a native of *Armenia*, who received from the Society for the Encouragement of Arts, &c. one hundred pounds, and also the gold medal of the Society, as a reward for discovering this secret.

ARTICLE I.

First preparation for the Skins, both for Red and Yellow Leather, by dressing them in lime.

LET the skins, dried with the hair on, be laid first to soak in clean water for three days; let them then be broken over the flesh side, put into fresh water for two days longer, and afterwards hung up to drain half an hour. Let them now be broken again on the flesh side, limed in cold lime on the same side, and doubled together with the grain side outward: In this state they must be hung up within doors over a frame for five or six days, till the hair be loose; which must be then taken off, and the skins returned into the lime-pit, for about three weeks. Take them out, and let them be well worked, flesh and grain,

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grain, every sixth or seventh day during that time: after which, let them be washed ten times in clear water, changing the water at each washing. They are next to be prepared in drench, as below mentioned.

ARTICLE II.

Second Preparation of the Skins for both the Red and Yellow Dyes by drenching.

After squeezing the water out of the skins, put them into a mixture of bran and water, warm as new milk, in the following proportions, viz. about three pounds of bran for five skins, and water sufficient to make the mixture moderately fluid, which will be about a gallon to each pound of bran. In this drench let the skins lie three days; at the end of which time they must be well worked, and afterwards returned into the drench two days longer. They must be then taken out and rubbed between the hands; the water squeezed from them, and the bran scraped off clear from both sides of the skins. After this they must be again washed ten times in clear water, and the water squeezed out of them.

Thus far the preparatory process of all the skins, whether intended to be died red or yellow, is the same; but afterwards those which are to be dyed red, must be treated as follows.

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ARTICLE III.

Preparation in Honey and Bran of the Skins that are to be died red.

Mix one pound of honey with three pints of luke-warm water, and stir them together till the honey is dissolved. Then add two double handfuls of bran; and taking four skins (for which the above quantity of the mixture will be sufficient) work them all in it one after another. Afterwards fold up each skin separately into a round form, with the flesh side inwards, and lay them in an earthen-pan, or other proper vessel; if, in the summer, by the side of each other, but in the winter on the top of each other. Place the vessel in a sloping position, so that such part of the fluid as may spontaneously drain from the skins, may drain from them. An acid fermentation will then rise in the liquor, and the skins will swell considerably. In this state they must continue for seven or eight days; but the moisture that drains from them, must be poured off, once or twice a day, as occasion may require. After this a further preparation in salt is necessary; and which must be performed in the following manner.

ARTICLE IV.

Preparation in Salt, of the Skins to be dyed red.

After the skins have been fermented in the honey and bran, as above mentioned, let them be taken out of that mixture on the eighth or ninth day, and well rubbed with dry common sea salt, in the proportion of about a half a pound to each skin; the

the salt must be well rubbed and worked with them. This will make them contract again, and part with a further considerable quantity of moisture; which must be squeezed out by drawing each skin separately through the hands. They must next be scraped clean on both sides from the bran, superfluous salt, and moisture that may adhere to them. After which, dry salt must be strewed over the grain side, and well rubbed in with the hand. They are then to be doubled with the flesh side outward, lengthways from neck to tail, and a little more dry salt must be thinly strewed over the flesh side, and rubbed in; for the two last operations about a pound and a half of salt will be sufficient for each skin. They must then be put, thus folded on each other, between two clean boards, placed sloping, breadthways; and a heavy weight laid on the upper board, in order gradually to press out what moisture they will thus part with. In this state of pressure, they must be continued two days or longer, till it is convenient to dye them, for which they will then be duly prepared.

ARTICLE V.

Preparations of the Red Dye, in a proper proportion for four Skins.

Put eight gallons of water into a copper, with seven ounces of Shenan*, tied up in a linen bag.
Light

* Shenan, is a drug much used by dyers in the East; and may easily be procured at any of the ports of Syria and Africa in the Levant. It is the eastern jointed cali, called by the botanists felicornia; and

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Light a fire under the copper, and when the water has boiled about a quarter of an hour, take out the bag of shenan, and put into the boiling fluid or lixivium, 1st, two drachms of alum; 2dly, two drachms of pomegranate bark; 3dly, three quarters of an ounce of turmeric; 4thly, three ounces of cochineal; 5thly, two ounces of loaf-sugar. Let the whole mixture boil about six minutes, then cover the fire, and take out a quart of the liquor, putting it into a flat earthen pan, and when it is as cold as new milk, take one skin, folded lengthways, the grain-side outwards, and dip it in the liquor, rubbing it gently with the hands. Then taking out the skin, hang it up to drain, and throw away the superfluous dye. Proceed in the same manner with the remaining three skins; repeating the operation on each skin separately, eight times, squeezing the skins by drawing them through the hands before each fresh dipping. Lay them now on one side of a large pan, set sloping, to drain off as much

and grows in great plenty in those and other parts of the East. There is a lesser species of the felicornia on our coast, which, from its great affinity with the shenan, might be presumed to have the same qualities. On some trials, however, it has not appeared to answer the intention of the shenan; but it will be prudent to pursue the examination of this further, as some unknown circumstances in the collecting or using the *English* felicornia, might occasion the miscarriage. But be this as it may, the eastern shenan may at all events, be easily procured in any quantity, at a very trifling expence, by any of the captains of *Turkey* ships, at *Aleppo*, *Smyrna*, &c.

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of the moisture as will run from them without pressure, for about two hours, or till they are cold; then tan them, as below directed.

ARTICLE VI.

Tanning the Red Skins.

Powder four ounces of the best white galls, in a marble mortar, sifting it through a fine sieve. Mix the powder with about three quarts of water, and work the skins well in this mixture for half an hour or more, folding up the skins four-fold. Let them lie in this tan twenty-four hours, when they must be worked again as before; then taken out, scraped clean on both sides, from the first galls, and put into a like quantity of fresh galls and water. In this fresh mixture they must be again well worked for three quarters of an hour; then folded up as before, and left in the fresh tan for three days. On the fourth day they must be taken out, washed clean from the galls, in seven or eight fresh quantities of water, and then hung up to dry.

ARTICLE VII.

Manner of dressing the Skins after they are tanned.

When the skins have been treated as above, and are very near dry, they should be scraped with the proper instrument or scraper on the flesh side, to reduce them to a proper degree of thickness. They are then to be laid on a smooth board, and glazed, by rubbing them with a smooth glass. After which they must be oiled, by rubbing them with olive oil, by means of a linen rag, in proportion of one ounce and a half of oil for four skins: then they

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are to be grained on a graining-board, lengthways, breadthways, and cornerways, or from corner to corner.

ARTICLE VIII.

Preparation with Galls, for the Skins to be dyed yellow.

After the four skins are taken out of the drench of bran, and clean washed, as before directed in the second article, they must be very well worked half an hour or more, in a mixture of a pound and a half of the best white galls, finely powdered, with two quarts of clean water. The skins are then to be separately doubled lengthways; rolled up with the flesh side outwards, laid in the mixture, and close pressed down on each other, in which state they must continue two whole days. On the third day let them be again worked in the tan; and afterwards scraped clean from the galls, with an ivory or brass instrument (for no iron must touch them.) They must then be put into a fresh tan, made of two pounds of galls finely powdered, with about three quarts of water, and well worked therein fifteen times. After this they must be doubled, rolled up as before, and laid in the second tan for three days. On the third day a quarter of a pound of white sea salt must be worked into each skin; and the skins doubled up as before, and returned into the tan, till the day following, when they are to be taken out, and well washed six times in cold water, and four times in water lukewarm. The water must be then well squeezed out, by laying the skins under pressure, for about half an hour, between two boards, with a weight of about

bout two or three hundred pounds laid upon the uppermost board, when they will be ready for the dye.

ARTICLE IX.

Preparation of the Yellow Dye, in the proper proportion for four Skins.

Mix six ounces of cassiari gehira*, or dgehira, or the berries of the eastern rhamnus, with the same quantity of alum, and pound them together till they be fine, in a marble or brass mortar, with a brass pestle. Then dividing the materials, thus powdered, into three equal parts of four ounces each, put one of those three parts into about a pint and a half of water, in a china or earthen vessel; and stir the mixture together. Let the fluid stand to cool, till it will not scald the hand. Then spreading one of the skins flat on a table, in a warm room, with the grain side uppermost, pour a fourth part of the tinging liquor, prepared as above directed, over the upper or grain side, spreading it equally over the skin with the hand, and rubbing it well in. Afterwards do the like with the other three skins, for which the mixture first made will be sufficient.

* The cassiari gehira is the berries of an eastern rhamnus, or buckthorn tree, and may be had at *Aleppo*, and other parts of the *Levant*, at a small price. The common *Avignon*, or yellow berries, may be substituted, but not with so good an effect; the cassiari gehira being a stronger and brighter yellow dye, both for this use, and also that of colouring paper-hangings, &c.

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This operation must be repeated twice more on each skin separately, with the remaining eight ounces of the powder of the berries, and alum, with the abovementioned due proportion of hot water put to them, as before directed.

The skins, when dyed, are to be hung up on a wooden frame, without being folded, with the grain side outwards, about three quarters of an hour to drain, when they must be carried to a river or stream of running water, and well washed therein six times, or more. After this, they must be put under pressure for about an hour, till the water be well squeezed out; afterwards the skins must be hung up to dry in a warm room.

This being done, the skins are to be dressed and grained, as before directed for those dyed red, except the oiling, which must be omitted.

F I N I S.